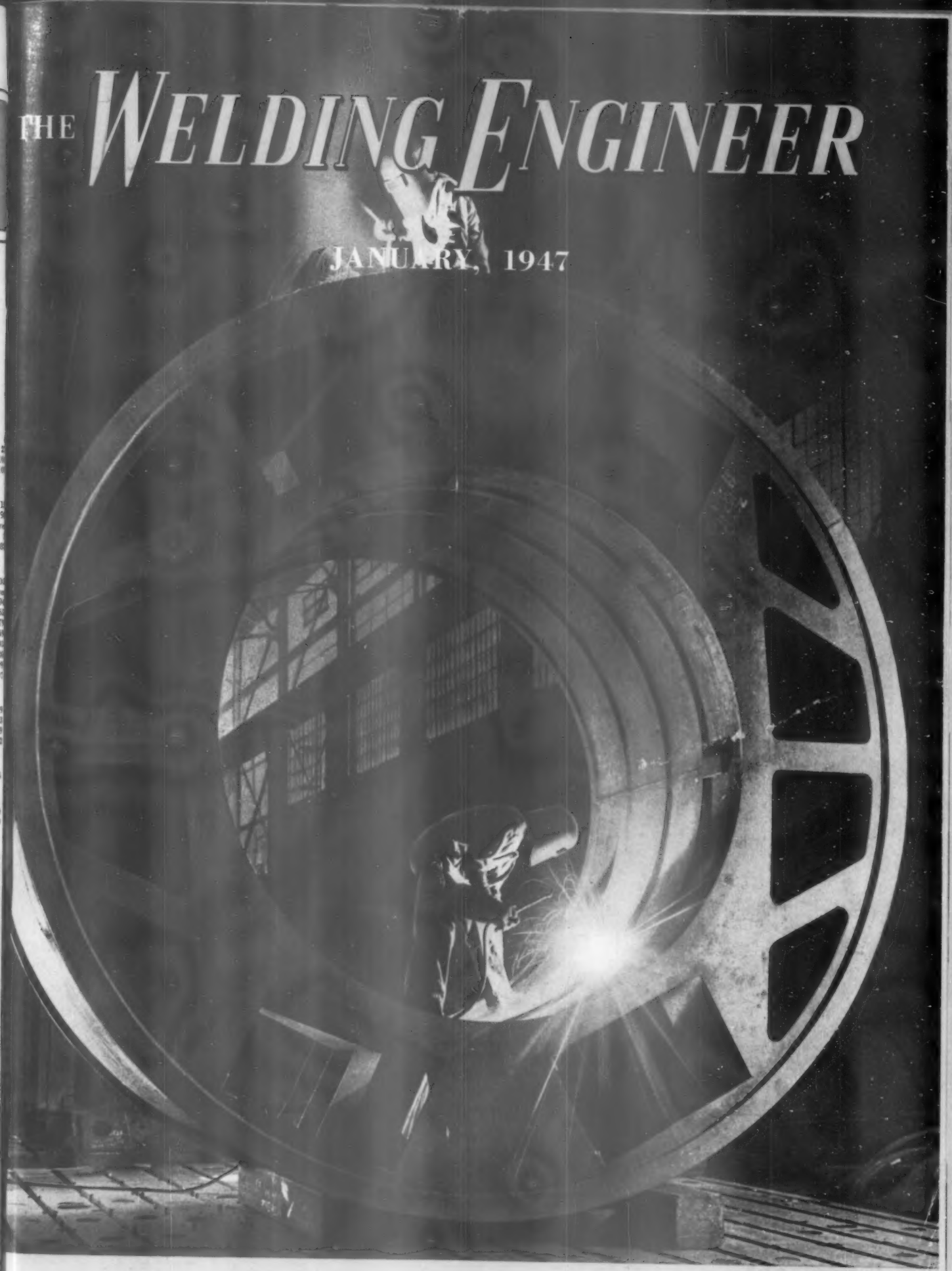
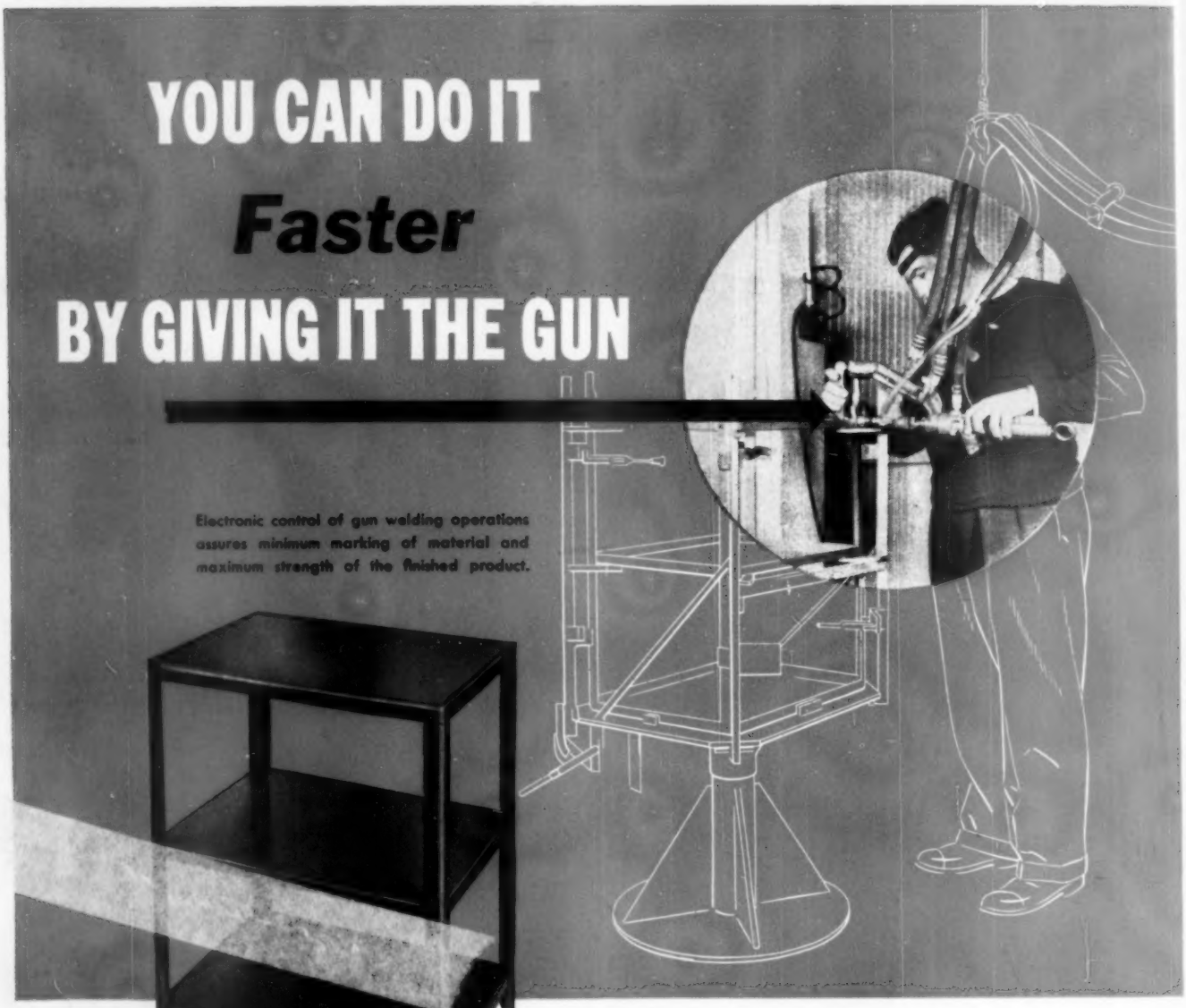
THE WELDING ENGINEER

JANUARY, 1947



IN THIS ISSUE: Welding Passes in Review . . . . page 33

YOU CAN DO IT *Faster* BY GIVING IT THE GUN



Electronic control of gun welding operations assures minimum marking of material and maximum strength of the finished product.

When you want to speed assembly of awkward multi-part units, here's a simple answer: give it the gun. Resistance welding with a gun welder can solve many a problem involving corners or hard-to-reach positions.

The three-shelf metal stand shown here is a good example. To move all seven of the parts to a stationary welder consumes too much time . . . and positioning would be extremely difficult. But utilizing resistance welding with a gun welder and a simple jig speeds the assembly.

The fixture swivels at the base to enable the operator to stand in one position while revolving all the corners into convenient position. The counterbalanced gun welder can then be applied to the four corners of the three shelves to make a total of 24 spots for each assembly. The assembled table is then easily removed from the hinged corner supports on the fixture. Result: 16 completed tables an hour by one operator with resistance welding!

The entire operation is controlled smoothly by Westinghouse Weld-O-Trol, heat control and automatic weld-and-sequence timer units. These three units start, stop, adjust the welding current, and activate the electrodes as well as time the individual functions of the welder head. Speeds of over 100 spots per minute can be attained with this equipment on some types of welding jobs.

The ability of resistance welding to handle unusual jobs easily and efficiently is an old story to users of this remarkable electronic tool. Ask your nearest Westinghouse office today to show you where resistance welding can go to work for you. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-21394

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Electronics at Work

THE WELDING ENGINEER

THE WELDING ENGINEER, with which is consolidated The Acetylene Journal

Volume 32 • Number 1 **JANUARY, 1947**

T. B. JEFFERSON.....*Editor*
CLYDE B. CLASON....*Managing Editor*
JOHN H. GIROUX.....*Assistant Editor*
DONALD D. HOGATE.....*Chief, Washington Bureau*
HENRY W. YOUNG..*West Coast Editor* (621 So. Hope St., Los Angeles 14)
JOHN CHAPMAN..*World News Director*
A. M. MORRIS.....*Publisher*

DISTRICT MANAGERS

T. E. Depew, 330 W. 42nd St., New York City 18 ● Joseph H. Allen, Jr., 520 N. Michigan Ave., Chicago 11 ● E. J. McOsker, 1510 Hanna Bldg., Cleveland ● Roy Phelan, 621 S. Hope St., Los Angeles ● John Otterson, 68 Post St., San Francisco.

THE WELDING ENGINEER PUBLISHING CO.
A Division of
McGraw-Hill Publishing Co., Inc.

Copyright 1947 All rights reserved By McGraw-Hill Publishing Co., Inc.

PUBLICATION OFFICE
212 E. York St., York, Pa.

EXECUTIVE OFFICES
330 W. 42nd St., New York 18, N. Y.
Telephone: Medallion 3-0700

EDITORIAL OFFICE
520 N. Michigan Ave., Chicago 11, Ill.
Telephone: Whitehall 7900

Return Postage Guaranteed. Branch offices San Francisco, Washington, Philadelphia, Cleveland, Detroit, Pittsburgh, St. Louis, Boston, Atlanta, Los Angeles. Published monthly. Entered as second-class matter at the Post Office at York, Pa. under the Act of March 3, 1879.

Subscription rates—Single copy 35¢ United States and Possessions $3.00 per year, $4.00 for two years, $5.00 for three years. Canada $4.00 per year, $8.00 for three years. Pan American countries $6.00 per year, $12.00 for three years. All other countries $15.00 per year, two years $25.00, $30.00 for three years.

Address correspondence regarding subscription matters to the Executive Offices at New York.

A McGRAW-HILL PUBLICATION

IN THIS ISSUE

COVER: One thousand pounds of welding electrodes were used in the fabrication of this 35,000-lb., 14-ft., 7-in. diameter generator yoke. Photo courtesy Allis-Chalmers Mfg. Co.

ARTICLES

Welding Passes in Review..... 33
T. B. JEFFERSON

Convention Report..... 37
CLYDE B. CLASON

28th National Metal Congress..... 64

Production

1 Braze + 120 Parts → 1 Cylinder Block..... 40
JOHN H. GIROUX

Welded Gears Replace Castings..... 47
J. H. CRUMLEY

Automatic Heaters Welded Automatically..... 58
M. G. HAWKINS

Maintenance

Welding in Railroad Maintenance..... 43
ARTHUR HAVENS

Research

Chrysler's Cycleweld Process..... 48
STANLEY H. BRAMS

Contact Arc Welding..... 54
P. C. VAN DER WILLIGEN

Operation

A Loom for Metal Fabric..... 53

Construction

Welded Pipes Remove Snow..... 62

All-Welded Luxury Liner..... 50

DEPARTMENTS

Editorial..... 31
Short Cuts and Kinks..... 66
Engineering Data Sheet No. 76..... 69
Free Literature..... 71
Opportunities for Welding..... 74
New Products to Use..... 88
On the Job..... 100
News of the Industry..... 102
About People..... 105
From the Patent Office..... 109
Searchlight Section..... 114
Advertisers in This Issue..... 116

There is a CHAMPION ELECTRODE for every welding job!

Mild Steel Electrodes

BLUE DEVIL	All Position, Reverse Polarity	A.W.S. 6010
BLUEDAC	All Position, A. C. Current	A.W.S. 6011
GRAY DEVIL	General Purpose, Poor Fit-up Straight Polarity	A.W.S. 6012
GRAY DEVIL No. 2	General Purpose, Smooth Bead Straight Polarity Also A. C. Current	A.W.S. 6013
BLACK DEVIL	Deep Grooves and Horizontal Fillets Straight Polarity	A.W.S. 6020 A.S.W. 6030
RED DEVIL	Deep Grooves, Reverse Polarity	A.W.S. 6030
BLACK DEVIL F. B.	Finishing Beads for Smooth Cover Beads	

High Tensile Electrodes

BLUE DEVIL 85	All Position, Reverse Polarity	A.W.S. 7010
RED DEVIL 75	Deep Grooves and Horizontal Fillets	A.W.S. 7020 A.W.S. 7030

Special Electrodes and Acetylene Rods

Stainless Steel Electrodes All types

Tool and Die Electrodes

High Carbon, Alloy and Manganese-Nickle Electrodes for Rail Welding

Electrodes & Acetylene Rods for Cast Iron Welding

Hard Surfacing Electrodes

Mild Steel Bare and Lightly Coated Electrodes

Bronze and Copper Alloy Electrodes and Acetylene Rods

Aluminum Electrodes and Acetylene Rods

Mild Steel and High Carbon Acetylene Rods

WELDING ACCESSORIES

CHIPPING GOGGLES
WELDING MACHINE: A.C. TRANSFORMER TYPES
WELDING GOGGLES · WELDING CLEANING TOOLS
WELDING CLAMPS · SAFETY CLOTHING · WELDING GLOVES
CARBON PASTE & FLUXES · WELDING CABLE CONNECTORS
WELDING CARBONS · CARBON PLATES · WELDING CABLE
WELD SPATTER ELIMINATOR · ELECTRODE HOLDERS

THE CHAMPION RIVET CO.

CLEVELAND, OHIO ★ East Chicago, Indiana

ESTABLISHED 1916

THE WELDING ENGINEER

JANUARY, 1947

The Job Ahead

NOW that the old year is gone, let us hope that with it will go the mistakes and outmoded viewpoints of the past. The new year lies before us like a fresh slate untouched by any mark of chalk. We will all be given a new chance in a bright new year, new opportunities to meet a challenging future. Shall we make a touchdown play, or will we fumble the ball? It all depends on you and me—upon the keenness of our minds, the courage of our hearts, the breadth of our vision.

Never before has this troubled old world so needed keen minds guided by clear vision. Realistic minds that can grasp facts as they are and deal with them unfettered by the prejudices and superstitions of the past . . . creative minds capable of conquering new details. Unless such minds as these are allowed to grow and develop, our present technological civilization is doomed as surely as Tyre or Nineveh.

There is no need for pessimism, no reason to fear the future. The United States has always been prolific in the production of creative minds, and it will continue to be so. But in the building of anything new—a new product, a new building, a new world—we must be alert to make the most of the possibilities within our grasp. More specifically, it is essential that all of us in the welding industry get together to promote a widespread educational campaign on welding and its related processes.

We cannot allow a lack of knowledge of the advantages of welding to impede our progress. There are today proper codes and specifications to cover welding applications of practically any nature. Every construction engineer, every technical society, every individual employed by a city, state or federal regulatory body must be apprised of the existence of these codes and convinced of their authenticity.

But that is only the beginning. It will not be enough merely to teach engineers the advantages of welding. We must begin far down the line, with the student in the first year of engineering school, with the worker in the metal-fabricating plant, with every actual or potential draftsman, detailer or designer who has or is likely to have anything to do with the preparation of drawings for fabrication. All of these men must be made fully conversant with the advantages and possibilities afforded by the intelligent use of welding. It is a big task, but one we must accomplish. Not until it is done will welding be used to its fullest extent.

Despite the mighty gains our industry has made in the past, the greatest opportunities for the use of welding still lie in the future. Before we can take advantage of them, however, it is vital for us, individually and coöperatively, to educate all possible users of welding in every possible way.

That is the job that lies ahead. If we make any progress at all on it, we shall find 1947 a glorious year.

Dissimilar METALS GET HAPPILY MARRIED WHEN JOINED WITH MUREX ALUMINUM BRONZE ELECTRODES

Brass can be welded to steel...iron can be welded to copper...and many other combinations of commonly used metals can be joined together with high strength and excellent bearing qualities—when the welding is done with Murex Aluminum Bronze Electrodes.

The Murex line includes *five* aluminum bronze electrodes, each with outstanding welding characteristics and exceptional physical properties...each designed to provide a certain Brinell hardness of deposit...and *all five* are made to satisfactorily take care of *any* application that an experienced welder may find in a day's work.

The superior results provided by Murex Aluminum Bronze Electrodes are achieved with a minimum of penetration and with quick cooling. Write today for further information about these products and ask for your time-saving application chart.

METAL[illegible] THERMIT CORPORATION

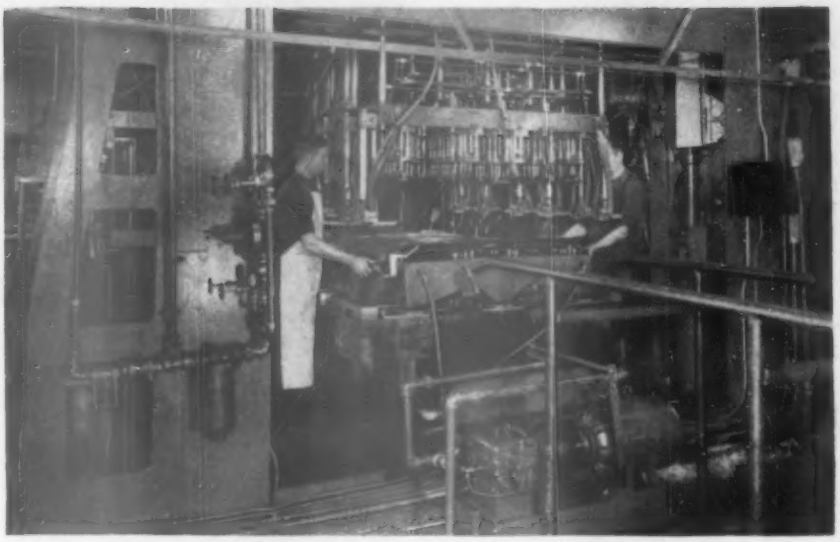
120 [illegible]AY, NEW YORK 5, N. Y.

Albany • Chicago • [illegible] • So. San Francisco • Toronto

WELDING Passes in Review

In a year crowded with labor difficulties, America has struggled to turn from a war to peacetime economy. While welding was held back like everything else, the outlook is good for the future.

BY T. B. JEFFERSON



Courtesy Progressive Welder Co.

Multiple spot welders are playing an increasingly important part in automotive production. This one is capable of making 130 welds in sequence and is shown here fastening stiffeners to an automobile body floor panel

HOPES ran high in industry as the New Year ushered in 1946. Never before had there been such a pent-up demand for all kinds of products; never before had there been so many skilled workers to produce these goods. An era of prosperity could hardly miss, said the economic soothsayers. It did.

Little did prognosticators realize that a situation had been developed that was to throw off all predictions for the year's industrial activities. Since hindsight is notoriously better than foresight, the confusion of 1946 has tempered predictions as to what 1947 holds for us. There may be seen a decided inclination to qualify all statements with a great big IF.

PULLING THE TRIGGER

V-J Day brought predictions from Government economists that within a few months six to eight million workers would be unemployed. This gloomy forecast was wholly wrong, but the fact was not realized and not proved until we were well into 1946. To avoid the letdown that they held inevitable for industry, Presidential advisers suggested that salary controls be released as a pump-priming move. This was promptly done, and labor immediately served notice that pay raises must be granted. As early as October, 1945, the automobile industry was confronted with a strike of vast dimensions. Coincident but not coincidentally, a committee of the then Secretary of Commerce Wallace proclaimed that the automotive industry could easily grant a 20% wage increase without any boost in the price of cars. From what fairyland this fantasy was drawn, it is impossible to say. Nevertheless, the combination of loud mouths with little thought had smashed Humpty-Dumpty beyond all possibility of repair.

If the automobile workers could get a wage increase, why not others? Such was the general attitude of labor after the 113-day General Motors strike had been settled on the basis of an 18½-cents-an-hour pay hike. Some unions had not waited to see what the outcome of the General Motors strike would be and were already vociferating their demands—and backing up their vociferations with strikes. In some plants outages of over one-year duration are still underway, and what labor can expect to gain to make up for the wages it has already lost is beyond human reckoning.

The General Motors settlement set a standard pattern, that of giving hourly instead of percentage increases and so lessening the spread between skilled and non-skilled workers. Not a very fair way of raising wages but one well in accord with Marxian ideology—though not in accord with the economic practices of the Soviets.

To keep the merry-go-round of strikes in action, the steel workers went out shortly after the auto battle was settled. Oddly, enough, there developed a shortage of steel,

which put automobile workers out of work again. So it went throughout the year. No sooner was one strike settled, than a new one began. Each fresh strike seemed to be in a new phase of industry so that all of the previously reconciled strikers were again thrown out of employment.

The effects of nation-wide strikes may easily be realized by considering our two coal strikes. These caused the nation to lose 95,000,000 tons of coal and as a direct result 8,000,000 tons of steel. Such a shortage of steel naturally stopped production in many other industries.

Courtesy Air Reduction Sales Co.

Flame-cutting makes it possible to shape and bevel steel parts rapidly for welded fabrication. Here 30-deg bevels are being cut on ⅜-in. plate

Welding a Victim

The steel and coal strikes cut into an important part of the welding field. The steel strike prevented the production of raw materials to make welding electrodes and cut off the source of rolled steel products needed for fabrication. Concurrently, strikes in the copper mines prevented the making of wire which could be made into welding machines and other electrical equipment. Then the electrical workers decided it was their turn to stop work to argue about a wage increase, delaying still more production of welding equipment.

As though strikes were not enough, industry was also being strangled by convulsions of the dying OPA. Most welding equipment controls were removed during the spring of 1946, permitting production to be resumed pretty generally throughout industry. Transformer-type a-c welders were still held under controlled prices, however, and because of OPA's reluctance to allow manufacturers to make a fair profit some manufacturers refrained from producing welders of this type. As unrealistic in its outlook as any dogma-blinded theologian of the Middle Ages, OPA kept insisting that there was no reason for increasing the cost of finished products just because wages had been raised. It is difficult to understand the thinking of bureaucratic minds, but it is not hard to see their effects upon our national economy.

A comic opera between the administrative and legislative branches of our Government finally led the President to veto OPA legislation in a fit of pique. For two months there was a price holiday while a new law was being agreed upon. The public thus had an opportunity to see what happened under a free economy, and they liked it. Though OPA was again reinstated, a demand for the removal of many controls went up. Despite the increasing pressure, it was not until October 18 that the Administration finally broke down and released all but a few food items from price control. This politically expedient move came too late to save the election, for on November 5 Republicans gained control over both the House and Senate for the first time in 16 years.

With OPA gone, prices immediately went up. It was to be expected. Already, though, the law of supply and demand has begun to manifest itself, and where production has been allowed to go up, prices have started to decline. It is difficult, however, to lower prices when industry is continually being confronted with threats of new strife.

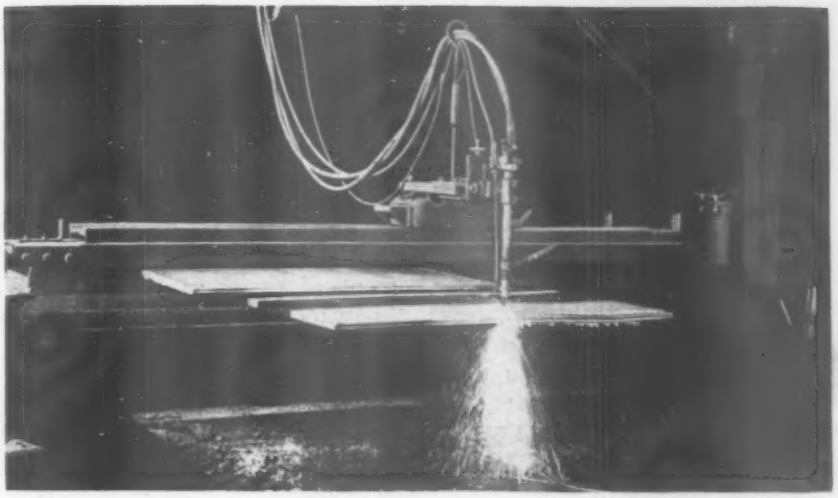
The economic fallacy of what labor is doing is apparent to everyone but labor. In his desire to seek better wage and hour conditions, the worker has failed to realize that production must be increased along with his salary. In some instances, production has actually gone down at the same time as wages have gone up.

In the automobile industry, for instance, as was pointed out by Congressman Carl Hinshaw, of California, in a recent address, the production of cars and trucks is down 10% below prewar averages while the number of man-hours of labor has risen by 78%. This means that it takes nearly twice as much labor to produce a car as it did from 1935 to 1939. Since wages, too, are up nearly 100%, the cost of labor in dollars is four times what it was in the prewar era.

It is obvious that wage hikes without more production cannot in the long run augment workers' ability to buy. Labor has failed to learn that simple lesson, though, and we are now hearing clamor for a second round of wage increases. Such an attitude can bring the worker to only one end—that of pricing himself out of employment. The interim results are further loss of purchasing power, decrease in production and economic chaos generally throughout the nation.

What Happened to Welding

Turning now to our own industry, we find that it was so busy trying to maintain production during 1946 there was not much time for new inventions. Welding progress is never at a standstill, however, and the industry learned how



Courtesy The Linde Air Products Co.

Powder flame-cutting a 1-in. clad-steel plate which would otherwise have to be sheared or cut by saws if shearing facilities were not available

to use more effectively the tools it already had. As a result, the new developments of 1946 were primarily expanded applications of existing processes.

The popularity of resistance welding is continuing to increase. Even while the market in other welding fields fell off because of interrupted industrial production, resistance-welding equipment was being purchased heavily in the automotive, home appliance and other fields employing light-gauge sheet metals. The result was that 1946 sales of resistance-welding equipment were the highest in history.

Much of the expanded use of resistance welding has been based upon the knowledge gained of this process during the war. It has been widely adopted for the mass production of identical examples in practically every industry fabricating sheet metals. While its use has mainly been confined to light-gauge materials, applications have been found and equipment manufactured for the resistance welding of steel plate up to $\frac{3}{16}$-in. thickness.

The year brought new developments and increased use of storage-battery-powered resistance welders, which overcome the inherent limitations imposed upon resistance-welding equipment by the non-availability of suitable power. One of the outstanding developments in the storage-battery-powered field was a new flash welder for the welding of aluminum.

The arc-welding field found new and important advantages in lime-ferritic electrodes. These are now being used to weld high-sulphur steels, air-hardening steels and complex alloy steels. While acceptance of these electrodes has been slow because of certain inherent shortcomings, new techniques are being developed which seem to make them well worthwhile. The favorable impact properties at low temperature that are developed in the weld deposits, together with the ability of lime-ferritic electrodes to satisfactorily weld steels which have heretofore been considered unweldable, will establish a unique position for this type of electrode coating.

The use of automatic arc welding was expanded considerably during the year. Several producers announced automatic welding wires designed to increase welding speeds. The general tendency seems to be towards the use of a smaller wire with increased welding current. It is the hope of manufacturers that these methods will enable them to surpass the speeds attained by non-arc automatic welding processes. A research race is on, and the outcome will undoubtedly lead to faster and ever faster automatic welding.

Welding went to the farm. Shortly before the first of the year the Rural Electrification Administration and the National Electrical Manufacturers Association developed specifications for arc welders for farm use. These welders, designed for operation with a maximum rated load of 130 and 180 amperes, could readily be used on farms served by 3-kva and 5-kva transformers, respectively, the prevailing REA sizes. The new standards made it possible to use welding equipment wherever single-phase power lines have limited capacity for serving either farms or communities. Because of these important developments, welding was prominently displayed at many county and state fairs for the first time in history. The farmer was definitely interested.

Arc Torches

The carbon-arc torch, introduced to the arc-welding field a number of years ago, came into its own with the more widespread use of welding on the farm. This type of equipment allows the weldor to do a job of arc welding that is more nearly akin to gas-welding technique than any other arc-welding method. Many farmers, being already acquainted with gas welding, were easily sold on arc welding when they could use the arc torch. Its higher concentrated heat and ease of control makes it possible for the relatively unskilled weldor to do many ticklish little jobs that are next to impossible with the metal arc.

In the closely related branch of atomic-hydrogen arc welding, a three-arc head was developed. This is said to permit faster work and better control of cooling temperatures than do the single-arc heads now used for the fabrication of tubing and thin metals.

Inert-gas-shielded arc welding—a wartime development that has been in continual research—blossomed out into more widespread production uses during the year. With the option of either argon or helium as the inert gas, the process is one that can readily be used to weld any type of material. In its early stages, the inert-gas process was confined to the welding of magnesium and aluminum. Its applications have now been expanded to include most non-ferrous materials and practically all ferrous except mild steel. While this method of welding does not prove

Courtesy The Linde Air Products Co.

Submerged-melt welding is now being used to weld non-ferrous as well as ferrous materials. Here it is being applied to a gas-turbine wheel made of heat-resistant alloys

advantageous over other welding methods on many ferrous materials, it is useful for stainless steel. And the elimination of fluxes and their inherent cleaning difficulties has definitely developed a place for inert-gas-shielded arc welding in the joining of most of the non-ferrous materials.

Powder Welding, Cutting

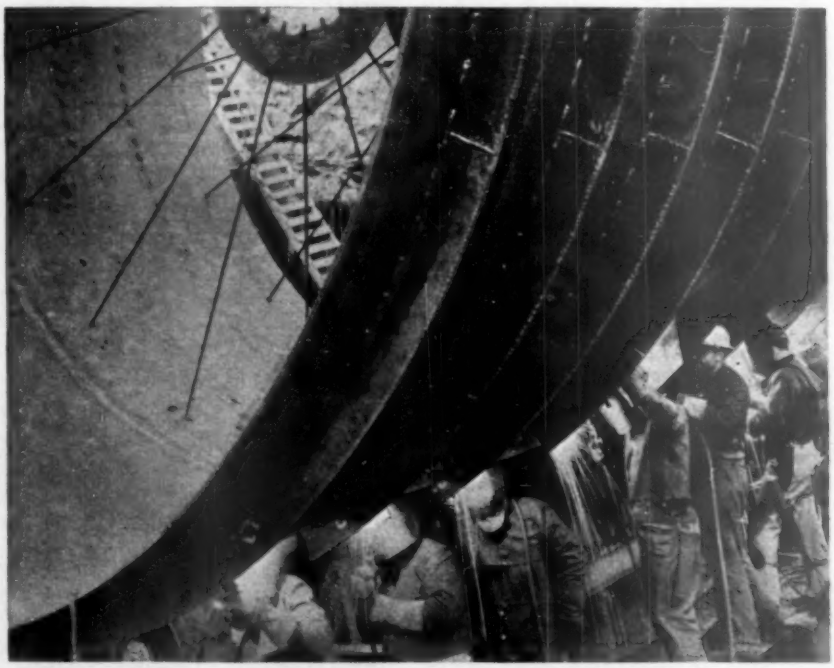
The year brought many refinements in the several processes for introducing powdered metals into the oxy-acetylene flame. When finely divided hard-facing materials are introduced into the welding gases, the need for both rod and flux is eliminated. The powder-welding process also makes it easier to overlay hard metals without distortion and overcomes many of the difficulties previously experienced. For example, it is now possible to apply hard-facing to a comparatively thin edge without distortion. The advantage of being able to direct hard-facing material readily where it is desired should make it possible to produce more satisfactory deposits.

Competition has already developed between the arc and gas branches for methods to be used in cutting stainless steels and other non-ferrous materials. Last year saw the first extensive use of the combination of a hollow metal electrode with an oxygen stream. Though the arc-oxygen cutting process has been well known to the Navy for underwater salvage work, it had not previously been employed to any great extent in surface operations. Using conventional welding equipment with a specially adapted electrode holder, it is possible to sever non-ferrous materials by arc-oxygen cutting. The arc continually melts down the steel electrode, providing the heat and oxidizing material needed for this method of cutting. The oxygen, fed through the hollow electrode, oxidizes the molten electrode steel and thus literally burns away the nonferrous material being cut. It is interesting to note that electrode design has been so improved that only a tiny area at a time will be heated. This minimizes the heat effects on stainless.

Flame-cutting is not to be overlooked in the severing of non-ferrous metals. The processes by which a powdered flux is introduced into the cutting-oxygen stream have found a much more widespread use.

The most important applications of powder flame-cutting were found in stainless steels, which represent the largest part of the oxidation-resisting metals. Since stainless steels are becoming increasingly important in industrial production and fabrication, years of research have been devoted to the problem of successfully flame-cutting these materials. This has finally culminated in the development of processes and apparatus to introduce a metallic powdered flux into the oxygen cutting stream so that the oxy-acetylene reaction will provide the necessary heating, melting and fluxing to remove the refractory chromium oxide.

The use of powdered metallic flux permits normal progressive flame-cutting and scarfing action on all types of stainless steels (as well as other high-alloy oxidation-resistant materials and certain non-ferrous materials) with high-quality results. The result of this development is certain to be a more widespread use of flame-cutting in the steel mill and foundry. The introduction of a powdered metal in the cutting flame will avoid many hours of back-breaking labor in the removal of gates and risers from large alloy castings as well as for the removal of defects from ingots, billets and slabs.



Courtesy The Lincoln Electric Co.

Seven arc weldors gang up to assist in the field fabrication of a penstock section for a large power and irrigation project in a western state

BY CLYDE B. CLASON

AGAINST a background of surf, salt air and shore food, the 27th annual meeting of the American Welding Society passed all too quickly from actuality to memory. Atlantic City provided five days of summery weather in mid-November for strolls along the boardwalk from the Ambassador (where AWS meetings were held) to the municipal auditorium, scene of the 28th National Metal Exposition.

It was a good convention, no matter how you looked at it. The 24 technical sessions were conducted with clockwork precision by the various chairmen and vice-chairmen. The 78 papers were careful, workmanlike jobs and were, for the most part, well presented. Microphones functioned perfectly, and the acoustics in each of the three rooms where the sessions were held left nothing to be desired. Listeners were attentive and contributed intelligent questions on the particular subjects up for discussion. The annual banquet was a pleasant social interlude. The ladies—entertained for the first time since the war—had a most enjoyable round of luncheons, fashion shows, bridge and bingo parties.

Only one real flaw could be found in this convention: the total attendance of around 1,100 seemed scarcely adequate to the magnitude of the preparations that had been made to receive them. Whether the cause was due to the uncertainties of travel created by the year's second major coal strike or the distance of Atlantic City from the Pittsburgh-Cleveland-Chicago-Detroit quadrangle in which the bulk of the metal-fabricating industry is located, the fact remains that the attendance did show a sad falling off from the 1,800 visitors who registered for the 25th annual meeting held 1944 in Cleveland. This is all the more regrettable as it was the first time in two years that all AWS members had been given the opportunity to attend a national convention.

ADAMS' LECTURE

Among the convention highlights was the 1946 Adams' lecture, presented on Monday evening, Nov. 18, by Dr. Wendell F. Hess, professor in metallurgical engineering and head of the welding laboratory of Rensselaer Polytechnic Institute. Dr. Hess spoke on the subject, "New Frontiers in Welding," to an audience that included Dr. Comfort A. Adams, founder and first president of AWS, in whose honor the lectureship was created.

Recent developments cited by Dr. Hess as being responsible for the new frontiers for the application of welding are: (1) the increased knowledge of the cooling rates associated with arc welding and of the metallurgy of the welding processes; (2) newer knowledge of the factors affecting cracking and of the magnitude of the residual stresses produced in arc welding; (3) extensive development of the spot welding of structural aluminum and magnesium alloys; (4) extension of the use of spot welding to the hardenable steels and to the heavier gauges of structural plates and shapes; (5) extension of the use of arc welding to the thinner gauges of mild steel and to the more hardenable alloy steels in heavier gauges; (6) the development of new equipment having improved characteristics with regard to power supply, speed of welding and quality of products.

"In the field of resistance welding," Dr. Hess concluded his lecture, "we may look forward to still further improvements in projection welding, seam welding and flash welding, both as to the methods of operation and as to equipment. In the field of arc welding we can expect greater improvements in electrode development, better quality of deposited metal and better operating characteristics in all welding positions."

ELECTRODE DEVELOPMENTS

Turning now to the technical sessions, several interesting papers were presented at the Electrodes session on Monday morning. One of these, on electrodes of the E-601X group, was written by Orville T. Barnett, of Metal and Thermit Corp., but read by C. B. Cooper. Mr. Barnett's paper suggested a simple word association for the five basic types in the E-601X group. The E-6010 and E-6011 classes may be characterized by the theme "penetration"; the E-6012 class by the theme "production"; the E-6013A electrodes logically suggest "sheet metal," and the E-6013B electrodes "fillet welding."

At the same session, Dr. Willi M. Cohn, consulting engineer and physicist and one of the co-inventors of the submerged-melt welding process, discussed recent developments in the manufacture of fluxes for automatic submerged-melt welding. There are three basic types:

(1) Ground or clay to which certain chemicals have been added. This type of flux is no longer being used to any great extent.

(2) Granulated glass. The basic ingredient is a calcium-magnesium metal silicate, to which a fluorine-containing material must be added.

(3) Granulated ceramic material. A typical composition of this kind is mullite with the formula $Al_6Si_2O_{13}$.

Dr. Cohn concluded his paper with a plea for the abandonment of secret formulas and methods of manufacture.

The world's largest resistance-welding fixtures, so huge that they can handle the entire side or entire roof of an 85-ft railroad passenger car, were described by Arthur M. Unger, welding engineer of Pullman-Standard Car Mfg. Co., at the Railroad session, also on Monday morning. At its newly modernized Chicago plant, Pullman-Standard has four side fixtures arranged to weld two car sides at one time and complete more than 7,000 welds in slightly over three hours. The fixture for welding car roofs permits more than 8,000 spot welds to be completed in slightly more than two hours. For smaller subassembly operations, the company has developed a multiple spot welder which will complete over 1,400 spot welds per minute.

James Partington, American Locomotive Co., revealed the latest developments in the rather controversial field of welded locomotive boilers. It was gratifying to learn that three locomotives with welded boilers have been recently put into service while 22 more are under construction for various railroads. The greatest venturer is the Chicago, Milwaukee, St. Paul & Pacific, which has ordered ten welded boilers. The type of welding being used is principally smothered-arc machine welding in the downhand position.

Tool and Die Welding

A very good paper on the welding of tools and dies, by A. R. Butler and Frank E. Kessler, Welding Equipment & Supply Co., was presented at the Monday afternoon session on Production. This paper stressed the metal-arc welding method in which the the deposited metal is hardened by air quenching from the heat of the arc. Tool-steel welding differs from hard-facing in that the deposits can be annealed for machining and afterwards rehardened by heat treatment. There are four major applications of the process, according to Messrs. Butler and Kessler: (1) to repair, salvage or reclaim worn or damaged dies and tools; (2) to fabricate compositely tools or dies; (3) to change designs and (4) to correct errors. Composite fabrication was explained as a method of making a tool or a die by welding hardenable cutting edges or working areas to a resilient core of mild or low-alloy steel.

Speaking at the Monday afternoon session on Storage Tanks and Pressure Vessels, Fred L. Plummer, Hammond Iron Works, made some excellent criticisms of present codes for field-erected pressure vessels. Design procedures, he said, in general require the determination of membrane stresses in vessel walls and heads but provide no guidance as to the determination of stresses at the junction of cylindrical shells and heads of various shapes, in areas where supports are attached to large vessels, at points of discontinuity caused by abrupt changes in thickness, shape or curvature and for stresses caused by eccentricities due to defective material or construction.

When designing products for resistance welding, it is important to know the answers to five questions, declared I. A. Crawford, Ex-Cell-O Steel Products Co., in a paper given at the Tuesday morning session on Resistance Welding. These are: Can the assembly be made in a flat position? Can materials of equal thickness be used? Are all joints accessible for welding? Can projection welding be used, eliminating a series of single spots? Is activity great enough to warrant the use of special machines such as hydromatic or multiple welders?

A paper on the evolution of Diesel-engine block weldment design and fabrication, presented at the Tuesday morning Machinery session by James W. Owens, Fairbanks-Morse & Company, warned management and purchasing agents against the use of "cost per pound" as a basis for comparing the costs of weldments and castings. Castings, he said, are usually either heavier than their corresponding weldments or they may have been intentionally designed and cast in a number of pieces to reduce foundry and machine shop scrap. In the latter case, however, the cost of subsequent machining or assembly operations is invariably increased, to the economic advantage of weldments.

At the Tuesday morning Research session, a significant paper was presented on the effect of peening on residual welding stresses. This was the joint work of E. Paul De Garmo, Finn Jonassen and J. L. Meriam, University of California. Several test panels made of 1-in. steel plate and containing 4-ft butt welds were fabricated with various peening procedures. Using the usual procedure of not peening the first and last passes, no difference could be detected in the results obtained by different degrees of peening severity, the maximum longitudinal residual stresses being approximately 48,000 psi in each case. It was found that stresses could be reduced to 25,000 psi if the last passes were peened after they had cooled to below 150 F. Contrary to prevailing practice, peening of the prior passes was unnecessary. If the plate metal for 2 in. on each side of the weld bead was peened as well as the weld metal, the stresses could be reduced below 21,000 psi.

The development of a laboratory instrument, the carbon-pole rheostat, into a practicable industrial tool has made feasible the use of storage-battery power for resistance welding, John D. Gordon, Progressive Welder Co., informed the Tuesday afternoon session on Resistance Welding. The carbon-pole contactor is now able to interrupt currents of as high as 50,000 amp without appreciable arcing. Whereas earliest models cost $2,500 each to build, more satisfactory ones can now be obtained for around $250. Storage batteries have also been vastly improved by water cooling and other features.

Flame-Cutting Stainless

Stainless steel flame-cutting was covered by two papers, presented at the Cutting sessions on Wednesday morning and Wednesday afternoon, respectively, by Howard Hughey, of Air Reduction Sales Co., and D. H. Fleming, of The Linde Air Products Co.

Since one of the primary characteristics of stainless steel is a strong resistance to oxidation, this material has naturally resisted attempts at flame-cutting, said Mr.

Hughey. Early attempts invariably followed the "thermal approach" in an effort to melt the refractory chromium-oxide film. These methods included the use of heavy preheat, waster strips, fluxing rods and oscillatory motions.

Mr. Hughey favors what he termed the "chemical approach," in which a fluxing powder (of unrevealed composition) is discharged with the cutting oxygen by means of a portable flux injector. Plates, shapes, risers and ingots can be cut with good-quality edges, the results being very similar to flame-cuts on carbon steel.

In his excellent paper on the powder cutting and scarfing of oxidation-resistant materials, Mr. Fleming told of the development of a process and apparatus for introducing a finely divided iron-rich metallic powder into the oxy-acetylene reaction zone to provide the necessary heating, melting and fluxing action to remove the chromium oxide. For stainless steels, cutting speeds are approximately equivalent to those obtained on the same thickness of carbon steel, but in general a tip one size larger is required. "Flying starts" (without preheating) are obtainable on all thicknesses of stainless. The process can also be used to cut cast iron and various high-alloy materials such as the new high-temperature, high-strength alloys.

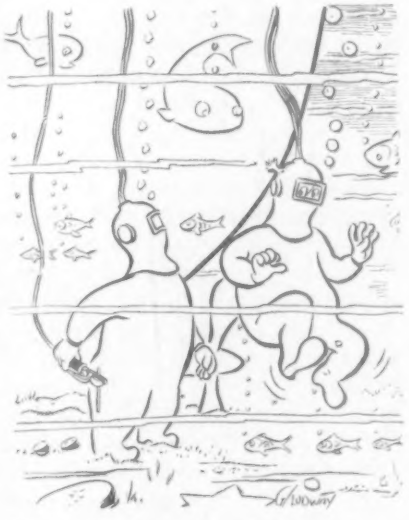
Arc-oxygen cutting for surface and underwater salvage operations was discussed by Charles Kandel, Craftsweld Equipment Corp., in a paper read during the Wednesday afternoon Cutting session. Some of the applications he mentioned were the cutting up for removal of two railroad bridge spans washed out in a flood (totaling approximately 300 tons of steel); the cutting of cast iron up to 8-in. thickness; the cutting of a bronze propeller hub approximately 4 in. thick; the cutting of stainless steel, in thickness of from $\frac{3}{16}$ up to 1 in., in preparation for welding.

Ten factors should be considered when choosing hard-facing electrodes or rods, Joseph A. Cunningham, of J. A. Cunningham Equipment, Inc., maintained before the Thursday morning Hard-Facing session. These are: (1) severity of abrasion; (2) type of impact; (3) necessity of rewelding worn hard-facing deposits; (4) size of part to be surfaced; (5) thickness of deposit required; (6) composition of base metal; (7) work-hardening encountered after welding; (8) corrosion conditions; (9) heat present or created; (10) postweld heat treating or machining requirements.

Design and production control of silver-alloy brazed joints was the theme of a paper by H. A. Smith and P. A. Koerner, Beech Aircraft Co., given at the Thursday morning Aircraft session. The proper engineering design of a silver-brazed joint, they said, must incorporate in the drawing the correct chamfers, surface finish, clearances, overlap, position of groove for the brazing alloy and cross-sectional area of the brazing-alloy rings. The drawing should also specify the grade of steel, if previously heat treated, its hardness after brazing and the type of brazing alloy and flux. The brazing operation itself may be accomplished by either the oxy-acetylene torch or by induction heating but must be done by an operator certified for the specific process to be used.

Helium vs. Argon

Newest wrinkles in inert-gas-shielded arc welding were reviewed by H. T. Herbst, The Linde Air Products Co., at one of the two Miscellaneous sessions on Friday morning. This process employs a sheath of inert monoatomic gas with a single tungsten electrode. Helium and argon are the two gases which may be used. Though the initial cost per cu ft of argon is slightly higher than that of helium, only $\frac{1}{2}$ to $\frac{1}{3}$ as much argon is required. Argon is also preferred for ease of control, particularly when welding thin material, and it is the only gas that will permit the welding of aluminum without a flux.



"One of those blank, blank guys from the other salvage crew welded my blank helmet to the ship!"

Investigation of current characteristics has had an important bearing on the advancement of the process. First used was direct current, reverse polarity; this was satisfactory for magnesium and aluminum but not for other metals. The use of direct current, straight polarity, has been found suitable for stainless steel, copper and nickel alloys and for brazing and hard-facing applications. Carbon electrodes are sometimes used with d-c, straight polarity, for easy starting in the fabrication of stainless steel, but their use is questionable.

Alternating current may also be employed for inert-gas-shielded arc welding by superimposing a high-frequency stabilizing current to aid in starting and maintaining the arc. Alternating current makes it possible to weld aluminum and magnesium without flux, and it has been found to give suitable welding characteristics on stainless steel, high-carbon steel, beryllium copper, bronze, Monel, silver and most brasses.

A new development is the "poke welding" process, which is used to join lapped sheets and is thus comparable to spot welding. Its advantage is that the equipment costs less than a spot welder, though operating costs, naturally, are considerably higher.

An increased use of the process for the welding of aluminum, copper alloys and stainless steels was predicted by Mr. Herbst. Procedures for the deposition of high-silver alloys on aluminum surfaces and of pure silver on various backing materials to provide highly corrosion-resistant surfaces were also foreseen, and it seems quite possible that an important place in the hard-facing field will be found for the inert-gas process.

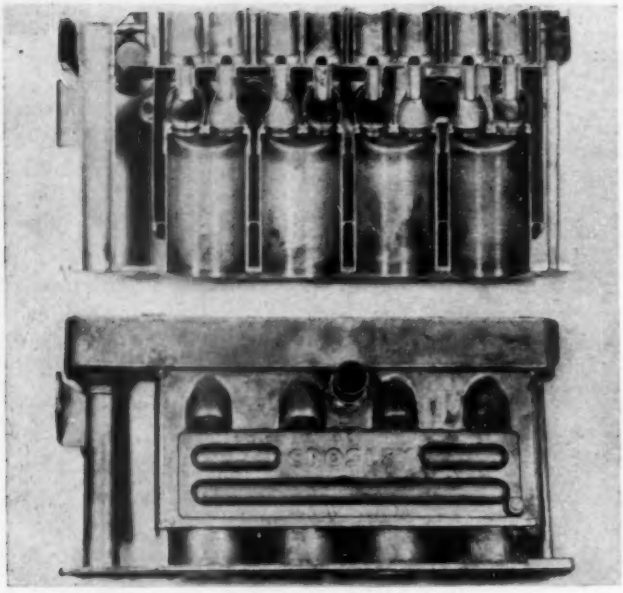


Fig. 1—The Crosley motor block consists of 120 separate parts brazed into a single unit. The heaviest part is the base plate, made from ¼ in. steel

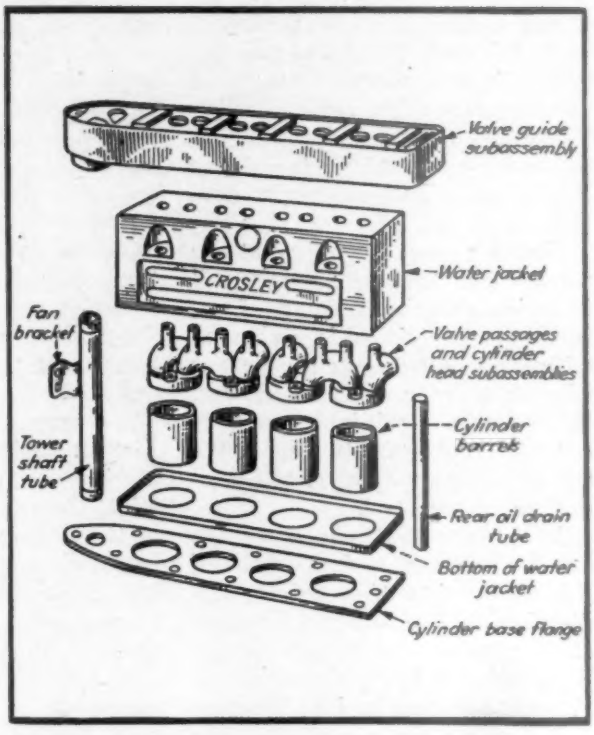


Fig. 2—Some of the separate parts. Cylinder barrels are tubing; other parts are stamped from sheet steel

1 Braze +120 Parts

"In unity there is strength" is true of the Crosley Motor Company's new automobile engine. The cylinder block is made up of 120 separate parts which are brazed into a single unit in one operation.

AUTOMOTIVE engineering has advanced another step. A four-cylinder engine that is a single unit of brazed sheet-steel construction certainly constitutes news—by any definition! In addition to the cylinder block, the crankshaft pulley, the fan assembly and pulley, water pump impeller and pulley are all copper-brazed steel stampings.

Lloyd M. Taylor, of Taylor Engines, Inc., Los Angeles, was granted a patent in 1943 for a means of constructing a sheet-steel engine by copper brazing its components in a hydrogen atmosphere. With an eye toward its postwar car, Crosley Motors, Inc., Cincinnati, obtained a license to use all patents and developments made by Taylor Engines. Under this agreement, Crosley supplied the Army and Navy with brazed-engine-driven generator sets for use in small Naval craft and as a starting unit for the big engines of the Air Forces' B-24 and B-17 bombers, engines similar to those now going into the Crosley car. Since these engines had to pass rigid government specifications before being accepted for military use, the engine of today is not an experiment to be paid for by the individual consumer.

Engine Design

Following V-J Day, Crosley started in earnest to prepare its war-born baby for civilian consumption. Under the direction of Paul Klotsch, chief engineer, company engineers re-designed an engine in which all parts of the cylinder block were to be brazed simultaneously into one unit. Among the redesign modifications it was necessary to reduce the compression ratio from 9:1 to 7.5:1 so that the engine could run on commercial gas rather than the high-octane fuel used by the armed forces. The carburetor venturi size was also reduced from ¾ to $1\frac{1}{16}$ in. diameter.

The engine, rated at 26 hp, has a bore of 2½ in. and a 2¼-in. stroke for a total piston displacement of 44 cu in. Bevel gears drive the overhead camshaft from the crankshaft, and helical spur gears drive the distributor and oil pump. The latter, together with the fan, generator and water pump, is driven at three fourths the engine speed.

A total of 120 separate parts are combined to form the cylinder block (Fig. 1), which weighs 14 lb 8 oz as it comes from the furnace ready for final machining. A variety of materials are used in this construction. Thin-walled alloy-steel tubing is used for the cylinders and cam follower guides, while the cylinder heads, intake and exhaust

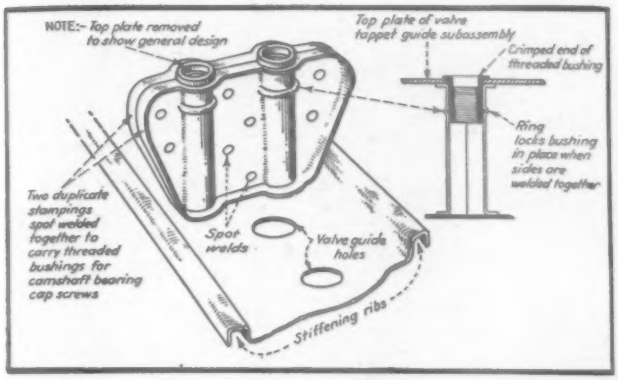
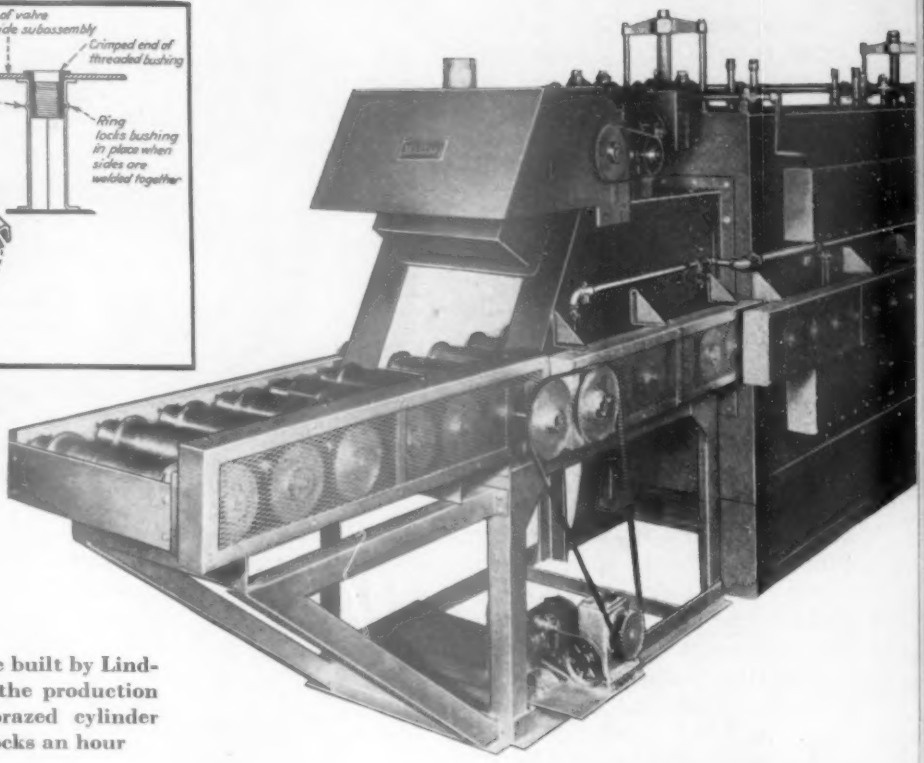

NOTE:- Top plate removed to show general design
Top plate of valve tappet guide subassembly
Crimped end of threaded bushing
Ring locks bushing in place when sides are welded together
Two duplicate stampings spot welded together to carry threaded bushings for camshaft bearing cap screws
Spot welds
Valve guide holes
Stiffening ribs

Fig. 4—Camshaft support made from two stampings. Note the spot welds and crimping in the top plate of the valve tappet guide subassembly

Sketches courtesy Product Engineering



Photos courtesy Lindberg Engineering Co.

Fig. 3—Roller-hearth electric furnace built by Lindberg Engineering Co., Chicago, for the production of Crosley Motor Company's all-brazed cylinder block. It brazes 28 cylinder blocks an hour

→1 Cylinder Block

★ PRODUCTION

BY JOHN H. GIROUX

parts, valve guides and water jacket are of sheet-steel stampings (Fig. 2). The remaining parts of the block are formed from SAE 1010 steel, a material which possesses high ductility as well as good drawing properties. The base, the heaviest part of the block, is made from ¼-in. steel plate.

To join these many parts into a single unit in one operation presented a serious production problem that was answered only after engineers from Lindberg Engineering Co., Chicago, came on the job. They designed a roller-hearth electric brazing furnace (Fig. 3) capable of handling loads up to 2,500 lb. It measures 61 ft 4 in. long, 4 ft 8 in. wide and 7 ft 6 in. high. Inside working dimensions are 9 ft by 1 ft 6 in. wide and 1 ft high. In the 36-ft-long cooling chamber there are two zones of control for progressively decreasing the atmosphere.

The furnace conveyor is provided with alloy-steel rollers capable of withstanding a temperature of 2,100 F. A variable-speed drive provides sufficient flexibility to meet any heating requirements which may be encountered in brazing applications. Gas flames curtain both the charge and discharge doors of the furnace and prevent infiltration of outside air. This flame curtaining eliminates all possibility of oxidation or discoloration of the pieces being brazed. Special trays, each capable of accommodating four cylinder blocks, carry the work through the furnace.

Use Controlled Atmosphere

The cylinder blocks are protected at all times from scaling or decarburization by a controlled neutral atmosphere composed of approximately 21% carbon monoxide, 40% hydrogen, 38% nitrogen and 1% methane. This gas is produced by cracking the hydrocarbon constituents (methane, ethane, etc.) of natural gas, though propane or butane gas may be used.

The cylinder block and its many components are fitted closely together and tack welded to prevent them from falling apart while being brazed. The only machining operation prior to brazing is semi-finishing of the valve seats and cylinder barrels. Such parts as the cylinder heads and exhaust elbows are held in place by shrink fits, spot welds or crimping to form a strong structure. A typical subassembly is the camshaft support, which contains two bushings for the camshaft bearings capscrew. This part is made from duplicate steel stampings, spot welded together as shown in Fig. 4. When it is in place, it supports the camshaft bearings and provides a means of holding the top piece of the valve guide box in place. This is accomplished by crimping ends of the threaded bushings over the plate.

After aligning operations have been completed, brazing copper is applied at the points of juncture. The size of the joint dictates the amount to be used. Copper paint is employed in the smallest joints, and copper wire is wrapped around the largest. The temporarily joined engine subassemblies are then automatically charged into the continuous roller-hearth furnace.

Brazes, Then Hardens

In an 8-minute brazing cycle, the blocks first enter the preheating zone, where they are gradually brought up to a brazing temperature (2,060 F). Gradually the conveyor carries them forward to and through the brazing chamber and then into a slow cooling zone, which reduces the temperature to about 1,500 F. Near the exit of the furnace, the block is quenched by a cool neutral gas, which reduces the temperature of the block to about 200 F. As might be expected, this quench serves to harden the brazed assembly. The gradation of the temperature drop determines the hardness of the cylinder wall, cam follower guides and intake, exhaust valve seats, etc. Since control of the quenching temperature is simple, it is possible to harden the work to any degree desired. Cylinder walls, which are made from chrome-moly steel (SAE 4140), emerge with a Brinell hardness of 280. Tungsten-vanadium alloy valve seats harden to about 450 Brinell.

Upon leaving the furnace, the blocks are hydraulically tested for leaks and are then prepared for final machining. The cylinder block at this stage of production is shown in Fig. 5. Due to careful design of the parts, warpage is held to $\frac{1}{64}$ in. in 16 inches. Small leaks may be repaired by silver brazing, but any large leaks require the entire unit to be scrapped. The final machining includes removal of the rivet heads that were used for joining the exhaust manifold flanges and the fuel pump.

The inside of the water jacket of the fabricated block is now coated with a special plastic to protect all of the surfaces which will be in contact with the cooling water. This coating is baked on and becomes so durable that it cannot be removed with either a strong caustic or acid solution. The ribbing of the water jacket (shown in Fig. 6) is such that in below-zero temperature tests, the cooling water has frozen solid without cracking any of the brazed joints or bursting the 20-gauge cylinder block.

The crankcase, an aluminum-alloy casting, weighs $7\frac{3}{4}$ lb and is 3 in. deep. The crankshaft has five main bearings and is completely counterbalanced within $\frac{1}{4}$ oz. The shaft is capable of enduring stresses as high as 6,000 psi.

This unique engine is now ready for installation in the chassis; all vital parts are easily accessible when it has been installed under the hood. The transmission is of the conventional type, three speeds forward, one reverse. Gearing is such that the car develops a maximum speed of 65 mph at 5,200 rpm engine speed.

Crosley's new aluminum-bodied car is a two-door model seating four persons, within an 80-in. wheelbase. Its overall length is 145 in., width 49 in. and height 57 in.; it weighs 1,000 lb. Compared to the prewar model, the new car is 28 in. longer, 2 in. wider and 50 lb lighter. Bodies are made by Crosley Motors, Inc., and the entire assembly is carried out in the company's Marion, Indiana, plant.

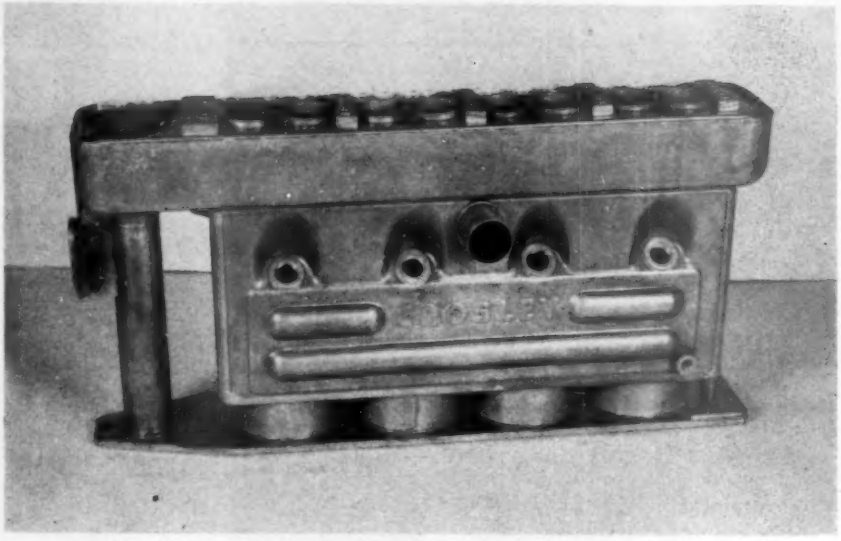


Fig. 5—The four-cylinder engine block after brazing. The valve seats and cylinder walls have Brinell hardnesses of 450 and 280, respectively

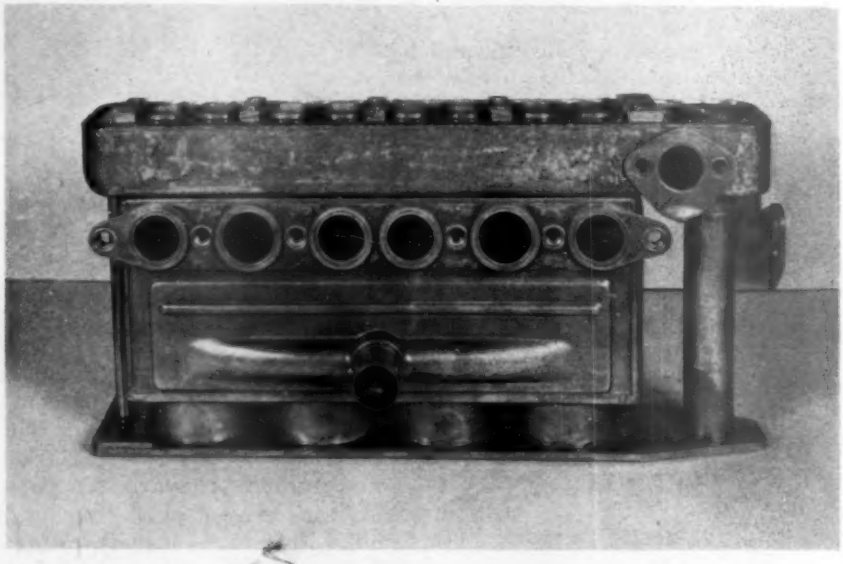


Fig. 6—The completed cylinder block weighs 14 lb. The ribbing on the water jacket helps it to withstand freezing at sub-zero temperatures

Welding in Railroad Maintenance

★ MAINTENANCE

Thanks to Yankee ingenuity, engine trucks of faulty design were successfully altered in a small locomotive repair shop. Broken driving boxes posed another tricky problem to be solved by arc and gas welding.

BY ARTHUR HAVENS

PEOPLE are funny. Today we witness a near miracle, and tomorrow we take it for granted as an everyday occurrence. Welding is no exception. The average weldor goes about his work with never a thought regarding the time and effort that have been expended in perfecting the practices and equipment he uses today. This is especially true on the railroads.

Welding has played an important part in the repair and maintenance of railroad equipment for over thirty years. When it was first introduced, its uses were confined to a very few jobs, the most important of which was the welding of locomotive frames. Some of these welds were successful and some were failures; enough, however, were successful so that those interested were able to realize the possibilities of welding. Right then and there began the trial-and-error method of evolving the almost foolproof welding practices and equipment of today.

Just taking a walk through a railroad shop where locomotives are repaired or through a locomotive building plant will definitely prove how far welding has progressed in the railroad field. On every hand you will find some welding operation in progress; in fact, one might be inclined to think that the entire shop was devoted to welding. This, of course, is not true, and the standard craftsmen, machinists, etc., are still very much in evidence, but it is safe to state that welding has so changed locomotive maintenance that to go back to the methods used before the advent of welding would slow the repair of these giants to a mere walk.

I recall an instance that I recently witnessed in a small locomotive repair shop. A certain group of Pacific-type engines had been giving a great deal of trouble —both to the engineers and to the repair department. It seems that these great steam-driven power plants would start to whip when they attained a certain speed, about 60 miles per hour, and would make it almost impossible for the engineer to stay in the cab. Normally, a locomotive has ¼-in. lateral on the back drivers, and these were no exception when they left the shop. In a few thousand miles, however, they would ac-

Fig. 1—These holes in an engine truck were plugged with pieces cut from the old pins. The plugs were then welded in place with ¼-in. electrodes

cumulate lateral to such an extent that it would be necessary either to remove the rear wheels and take up the lateral or to reduce the lateral wear by offsetting the shoes and wedges. Incidentally, the weldors in this shop have hit upon a speedy method of reducing driving box lateral that I will relate later.

It was not at all uncommon to find that the bronze shoes and wedges had pounded into the pedestals a quarter inch or more to add to the already serious condition on the rear wheels. This trouble had existed for several years and was accepted as a peculiarity of this type of locomotive. The superintendent of motive power refused to accept that answer as final, and eventually he discovered what seems to be a satisfactory cure to this ailment.

Alter Swing Links

When these engines were constructed, the engine truck or lead truck, as it is commonly called, was designed with a female center casting swing link arrangement that created a 17% initial resistance on the slightest curve. Obviously, this resistance would increase with the curvature of the track until it reached 85% on the maximum curve possible for this type of locomotive. It seemed probable that the first thing that happened when the locomotive went into a curve was for the rear end of the engine to swing to the opposite side and then grind away at the hub faces until the engine truck relieved the pressure.

Naturally, the only answer to this problem was to reduce the inbuilt resistance of the center casting swing link arrangement. Imagine even attempting a job of this magnitude without welding! It would mean dismantling of the entire truck, making new castings (with the related cost of new patterns etc.) and reassembling. Thanks to welding and cutting, however, plus a little Yankee ingenuity, these trucks were altered with a minimum of time and expense.

The center casting was suspended on links that were each hung on a pair of 2-in. pins placed 5 in. apart. Calculations on the drawing board showed that if the center-to-center distance between the two pins was reduced to 2 in., the initial resistance would be cut down to 3% and would build up to a final resistance of only 30%. It was determined that this alteration would accomplish the desired purpose.

To change the centers of the swing link hanger pin holes, it was first necessary to fill 16 holes of 2-in. diameter. These were plugged with 2-in. pieces flame-cut from the old pins. The pieces were fitted into the holes so that about $\frac{3}{8}$ in. would be left on each end for welding. The "stoppers" were then welded solidly in place, using $\frac{1}{4}$-in. heavy-coated electrodes with straight polarity (electrode negative). Fig. 1 shows the welding operation, but unfortunately the glare of the arc blocks out a view of the plugs.

When cool, the casting was chipped smooth; new holes were then laid out on 2-in. centers, drilled and counterbored. While the machinist was drilling the holes, the weldor tackled the swing links, which had to be closed to fit on the new centers.

This operation offered a little more difficulty than the problem of filling the holes. The management's first thought was to forge new links, but after it had witnessed the ease with which the weldor changed the old ones, the welded repair method was accepted as standard. Fig. 2 shows the link before altering. Enough stock was cut from the top (Fig. 3) so that the link could be closed (when heated) to swing free on the

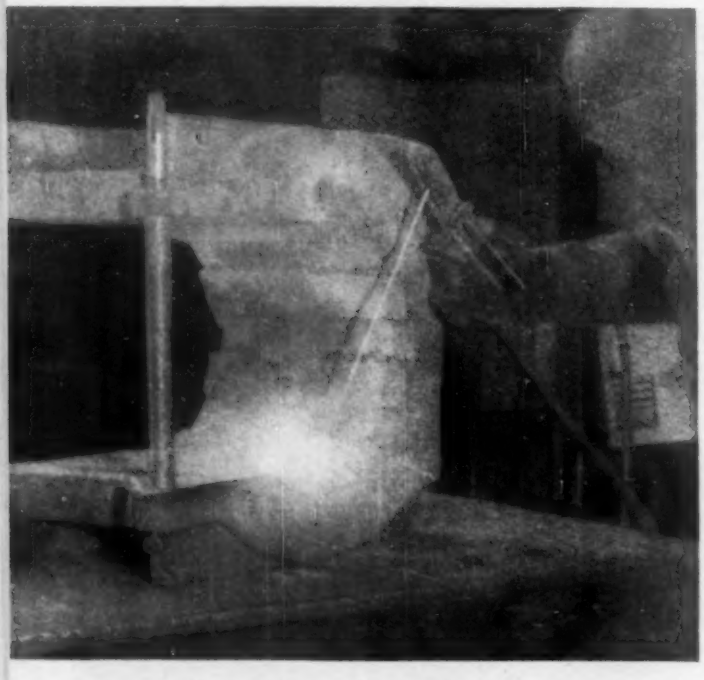


Fig. 5—The welding arc was called on to reinforce the critical area of the dovetail on a driving box

Fig. 4—A quick way to reduce excessive lateral in driving boxes is to apply babbitt metal with a torch

Fig. 2—The swing link before it was altered to fit on the new centers provided for the hanger pin holes

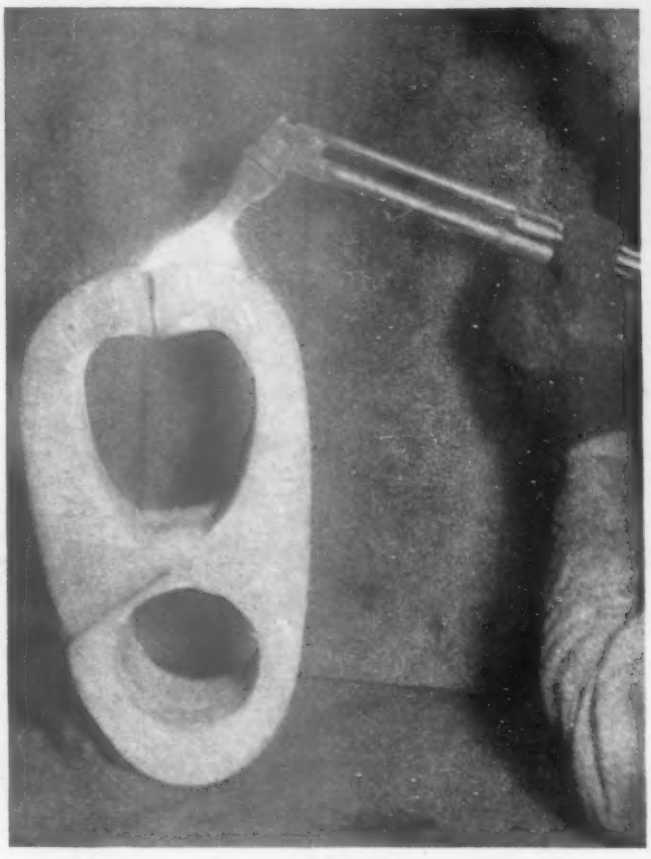


Fig. 3—The swing link after being cut out and closed. The gap in the top is being sealed by welding

new 2-in. centers. After closing the link to the desired dimensions, the cut in the top was welded with heavy-coated electrodes. The inside was then ground out to make a satisfactory fit.

Needless to state, after one locomotive had been repaired in this manner, it was given a series of tests to determine the feasibility of continuing this type of conversion. As a result, the procedure outlined has become a standard practice, and all locomotives giving this trouble of "whipping" will be changed in a like manner.

Babbitting with a Torch

Now back to a speedy method of reducing lateral. Ofttimes it is necessary to take a locomotive out of service because one pair of driving boxes has excessive lateral (more than ¾ in.). The usual method is to replace the driving boxes with new ones having the desired thickness of hub face. Of course, this means new shoes and wedges and boring the journal fit on the new box—all a time-consuming operation. If the boxes are in good shape except for excess lateral, a good weldor with an oxy-acetylene torch and a small tip (Fig. 4) can apply enough babbit metal in a very few minutes to reduce the lateral to normal. If this is done, the boxes can be reapplied to the axles without any fitting, the same shoes and wedges can be used and the wheels installed in their proper place in a minimum of time. Thus what is usually a two-day repair job can be turned out in a few hours.

The welding torch has certainly effected a neat saving on this item! The weldors in this shop keep a good supply of babbit rods on hand. These are cast in the foundry in a convenient size to handle—about 1 in. in diameter by 15 in. long.

Sometimes the shoe and wedge flanges pound into the frame pedestals to create a worn spot of ¼ in. or more in depth. Here is another opportunity for a good arc weldor to exhibit his skill. Obviously, an excessive amount of weld metal will make a great deal more grinding for the machinist. But if the weldor is conscientious and uses a small electrode, he can apply just enough metal to eliminate the wear and save many hours of hand grinding.

Most railroads have attempted at one time or another to eliminate the wearisome task of rebolting frame castings, by welding them to the frame. In most instances, this has failed to fulfill the desires of the management because of an error in judgment on the part of the weldor and the foreman. They seem to expect a single bead of arc welding will hold in place a casting that has been designed expressly for bolting (and which the bolting has failed to hold). Enough metal must first be removed from the casting so that the frame itself is exposed to a point where a good, heavy 1-in. fillet weld can be made. And instead of the usual practice of welding here and there where the joint is easily accessible, the whole casting should be welded solidly. A casting secured to the frame in

this manner will remain in place indefinitely. In this application, like most others, the largest electrode that can be used readily is the one most economical. Usually a ¼-in. or 5/16-in. electrode can be used.

Broken Boxes Cause Trouble

A certain railroad was in the habit of purchasing many of its driving boxes for older locomotives with the crown brass area cast with a deep-grooved dovetail to receive a poured bronze. Originally these engines were of the saturated type, but following the modern trend they were superheated; *i.e.*, rebuilt so that superheated instead of wet saturated steam was admitted to the cylinders. Soon after these locomotives had been converted to superheating, there began an epidemic of broken driving boxes.

Sometimes a crack would start in the shoe and wedge channel and not go any farther. This caused no particular worry. When a box would break into two pieces, however, necessitating the removal of the engine from service and the added expense of removing the wheels to replace the broken box with a new one, it became apparent that some remedy must be found. The general opinion that old age might be causing the broken boxes was soon discounted when it was discovered that new boxes broke as readily as the old ones. Several new boxes were normalized and tested, but this made no difference. Obviously, the design of the box was wrong and could not withstand the added stress imposed by the superheated steam.

Welding was called upon to fabricate some test boxes in which it could be determined whether or not the present box could be altered so as to serve the purpose desired of it. A careful examination revealed that all of the boxes broke in approximately the same spot. The crack or fracture seemed to start from a corner of the lowest dovetail and extend up to and through the shoe or wedge channel. It was decided to fill this area solid with arc-welded material, Fig. 5. This called for a weld some 6 in. wide by 12 in. long that varied in thickness from 3/8 to nearly 1 in. When the boxes were built to a predetermined thickness, the flux was all removed and the surface ground bright. Wear-resisting bronze was then applied with the torch (Fig. 6) to a depth to allow for machining to the desired axle size. This was, in effect, a quarter bearing applied by welding. The remainder or top of the crown brass was poured in place according to the usual custom. Instead of the hub face being poured integral with the crown brass, it was applied later by torch welding; this also tended to increase the ultimate strength of the box.

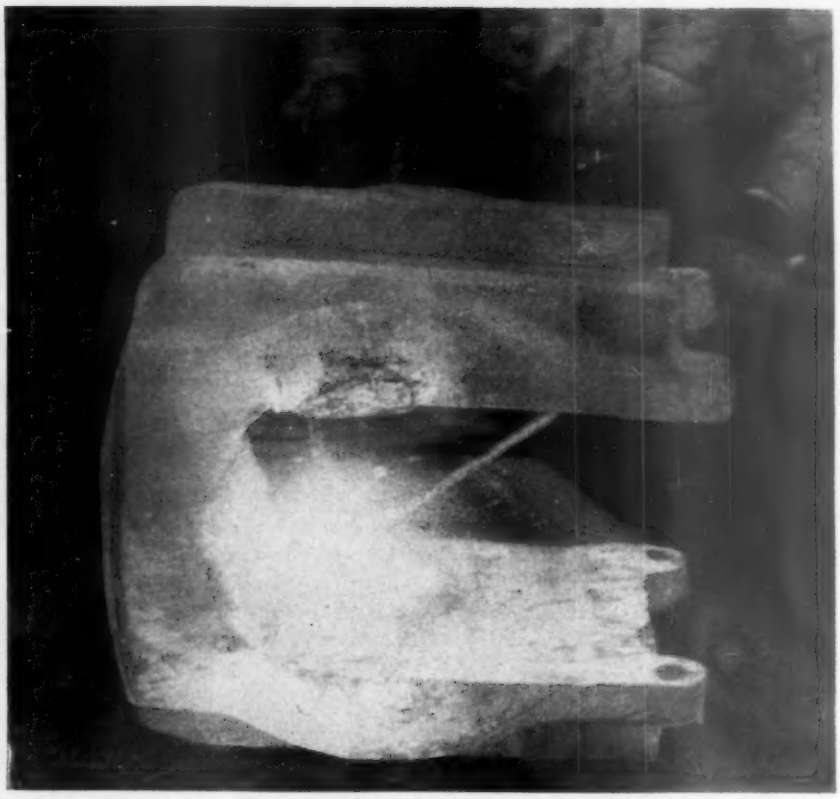


Fig. 6—Wear-resisting bronze was applied with the torch and a ½-in. filler rod to create a welded quarter bearing on a test driving box

This extensive effort to strengthen the critical area paid dividends in fewer broken driving boxes. It was decided later to change the pattern and eliminate the dovetail. All boxes of the newer type have a welded quarter bearing—another neat welding application.

It is an accepted practice in most railroad shops to put liners in the driving box shoe and wedge channels. This is done for two reasons; first to strengthen the box and secondly to keep down the thickness of the shoe and the wedge. When the liners were first applied, it was customary to drill several holes in the plate (liner) and to weld through the holes; the liners were also welded along the ends. Upon removal of the liners for repair, it was found that the welds made through the holes were always broken.

A new method has proved much more successful. When the liner is trimmed to length with the cutting torch, about ½ in. is cut off along the sides at all four corners, extending back toward the center of the box about 4 in. These cuts make a groove about ½ in. wide between the box and the liner, which is welded solidly with coated rod. The ends are also welded with one bead of ¼-in. electrode. Liners applied in this manner give very little trouble and remain in place from one shopping to another.

I believe the foregoing will make it quite clear that welding, both oxy-acetylene and electric, occupies a prominent place on the list of locomotive repair tools. Now as never before the wise management thinks first, "How can the job best be done by welding?"

Welded Gears Replace Castings

BY J. H. CRUMLEY
Superintendent of Welding and Fabricating, Western Machinery Corp., Portland, Ore.

THE welding department has replaced the foundry at Western Machinery Corporation (formerly the Hesse-Ersted Iron Works), which produces heavy machinery for the lumber, marine and construction industries. As one example of the replacement of castings by welded fabrication, all of the gear blanks are now fabricated instead of being cast from iron or steel as was the former practice.

A typical fabricated gear blank (Fig. 1) is made by tacking a rim and a rough-turned hub forging to a 1-in. web plate. The rim is rolled from a 2 by 5 in. mild-steel bar to the proper circular shape, but it is not welded into a continuous ring until after tacking has been completed. The vee for welding the rim is placed so that all welding is done from the outside.

The Welding Procedure

The gear blank is then fabricated using the following welding sequence:

(1) The rim is welded into a continuous ring. This is done while the ring is in a horizontal position, necessitating a vertical weld. The first pass is made with an E-6010 electrode. After this bead is cleaned, welding is continued with either an E-6020 or E-6030 electrode. A hot, digging arc is used to insure complete penetration on all of these subsequent welds.

(2) The blank is now placed so that the web may be welded to the rim in a downhand position. The web was previously beveled on both sides so that a full penetration fillet may be readily obtained.

(3) Lastly the hub is joined to the web by means of fillet welds. Again full fillets are made on both sides of the web. After the gear has cooled, it is now ready for the addition of finish beads or stiffener bars as the case may be. In some instances where such beads or bars are not required, lightening holes are cut in the web.

Occasionally the clutch side of the gear is finished with a cover plate, Fig. 2. In this instance a welding sequence similar to that used in fabrication of the gear is employed. The plate is first welded to the rim and, after this welding operation has been completed, is then welded to the web in the vicinity of the hub.

The other side of the web is then fitted with stiffeners cut from 1½ by 2 in. steel bar stock. These radial stiffeners (Fig. 3) have the appearance of spokes. Here again welding is begun in the rim and carried into the hub with fillet welds on both sides of the spokes. The finished gear is now ready for mounting on a log yarder or loader winch, as may be seen in Fig. 4.

Distortion Eliminated

The outside-toward-center welding sequence that we use places the rim in compression while the web is in tension. As a result stability is maintained in the gear so that there is no distortion when the teeth are cut in the gear blank. In our two years of producing fabricated gears of this type, we have never encountered any evidence of distortion. Another advantage of the fabricated gears is the uniformity of the steel in the rim. Because of this uniformity, the life of the gear cutters has been materially increased. It is not at all unusual for us to cut as many as four of these 34-in. diameter fabricated gears between sharpenings of the cutter.

Fig. 1—Gear-blank assembly. The flange is made by forming a length of 2 by 5 in. bar stock into a ring of 34-in. OD. To this is tacked a web of 1-in. mild-steel plate. The hub, a drop forging of 8-in. OD, is also tacked to the web

Fig. 2—A cover plate is welded to one side of the gear blank, working from the outside to center

Fig. 3—On the opposite side from the cover plate six spokes are welded between the rim and the hub to give additional stiffness

Fig. 4—The finished gear. Note that the clutch ring is mounted on the side opposite the spokes

CHRYSLER'S Cycleweld Process

★ RESEARCH

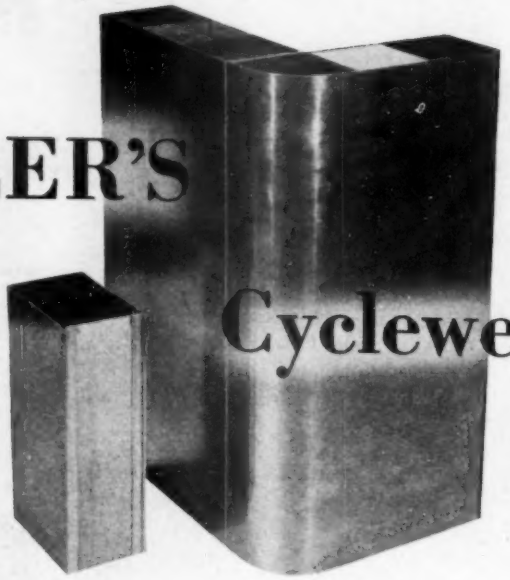


Fig. 1.—Sandwich panel which employs three different core materials—sponge rubber, cork and balsa wood. These are joined together and to the outer sheets by Cyclewelding

Despite its name, "Cycleweld" isn't any form of welding. However, it is a process that may enter into competiton with welding on some specialized applications.

BY STANLEY H. BRAMS

THE first publicizing of the Cycleweld bonding process of Chrysler Corp. occurred during the war period, but the information was restricted on military grounds and hence reported in fragmentary fashion. As a result, many concerns and technicians in the welding industry got the idea that "Cycleweld" was a process with close kinship to arc, gas or, most likely, resistance welding.

Actually nothing of the kind is true. Cycleweld may be described as a method of joining two materials, but the materials are always separated by the cementing agent and never assume the homogeneity of a weldment. Because Cycleweld produces physical properties well in excess of ordinary gluing or cementing—and because the process uses heat and pressure—it might be described as an operation midway between welding and ordinary cementing, employing some of the manufacturing characteristics of each but producing an end result typical of neither.

Functioning as it does in that in-between area, the Chrysler process doubtless will ultimately compete with some applications of both techniques, but its larger place will almost certainly be in bonding functions which have hitherto not been carried out to fullest satisfaction by either method or which have been impossible up to now.

It Differs from Welding

There are a number of obvious differences between Cycleweld and welding of any type. The most important of these is that the parent materials (which can be metals or practically any other kind of solid) do not flow into each other but are held together by the adhesive properties of the cementing agent. In welding, of course, metal is melted, puddled together, then cooled into one physical section. In welding, the bond is often stronger than the parent metal; in the Cyclewelding of metals, the bond is weaker than the metal, although (in joining rubber and like materials) frequently stronger than non-metallic substances.

Cycleweld does possess inherent advantages not found in welding. Built-up stresses are much milder, and joint corrosion can be avoided. Another notable advantage of Cycleweld is that there appears to be no vibrational effect on the bond, which functions in part as a damper.

Cyclewelding is based on the patented use of a phenolic substance in a formulation with synthetic rubber resin. One new variant is a paper-thin ribbon designed to be placed between sections to be bonded, something like thin strips of brazing alloy are employed for furnace brazing. Generally, however, the substance is in liquid form and is compounded to viscosities ranging from extremely light to very heavy, depending on the use for which it is intended.

The liquid Cycleweld cement may be dipped, painted or sprayed onto the precleaned edges of the pieces to be joined. Sometimes these pieces are preheated, again depending on the application. After one or both surfaces to be joined have been covered with cement, the work then goes into fixtures which maintain a predetermined pressure varying from 25 to 250 psi while heat is applied. Either a furnace or an open flame is used for heating, and the temperature is held to between 200–300 F for time cycles ranging up to 15 or 20 min. The work is then allowed to cool in air.

One great advance in tooling which is expected shortly out of Chrysler's experimental lab will be the use of an oven-roller combination for the continuous production of sandwich-like panel sheets, made either of metal or of varied materials. The panel shown in Fig. 1 has a core of three different materi-

als—hard sponge rubber, cork and balsa wood. Units such as this will go into one end of a gas-fired oven and thence between rolls for pressure requirements. Present practice, done on prototype machinery, is to pass the work through the rolls at a rate of about 6 ft per min, but expectations are that this rate may be notably increased as the proper correlations with furnace heat are developed.

A Strong Cemented Bond

Whether by this means or any other method of fabricating, the result is an assembly bonded somewhat in the same fashion that two thicknesses of plywood are laminated with plastic glue. As in plywood, the pieces retain their individual identity and are modified only by their linkage through the intermediate cementing agent. This contrasts notably with any form of welding. Cycleweld, however, is much stronger than orthodox glues or cements (see Table I). Shear strength runs up as high as 3,800 psi in some specifications although the 2,000–3,000 psi range is more typical. Tension failure does not generally occur before a range of around 1,500 psi in most applications, one formula having a tension property upwards of 3,000 psi. Creep ranges no higher than 0.010 in. for most formulas.

The material is very flexible to work with. This is evidenced by the heat and pressure cycles specified for now and later in Chrysler's own manufacture of brake lining assemblies. The drums are preheated to 180 F, and the cement is sprayed on and allowed to dry for 15 min. The linings are then applied, and the assembly is put in a fixture which holds the joint under a pressure of about 225 psi. Finally, the fixture is passed through a furnace, where it is heated at 325 F for 15 min.

Certain physical characteristics of Cycleweld put definite limitations on the process. Two varieties are not recommended for continued use above 300 F, one at no higher than 200 F and two at no higher than 150 F. However, a new formulation, H-1, being used in production by Chrysler to join brake linings to shoes, where it supplants riveting, is capable of continued use under high-temperature conditions.

Salt spray has a bad effect on most formulations, and humidity affects some. Peel strength is very weak, inasmuch as adhesion is accomplished through a multiplicity of linkages so that any effort to peel materials apart meets resistance only through a thin (and consequently very feeble) line rather than a solid.

On the other hand, Cycleweld has shown notable indifference to cold, oil, water and most solvents. This ability gives it notable advantages over many other adhesives of other types.

So far as competition with welding is concerned, the prime effect of Cycleweld in the program now in development at Chrysler appears to be in the plans for production of a variety of the sandwich-like

Table I. Physical Properties of Cycleweld Cements for Metals

Cement	*Materials Bonded*	*Shear, Psi*	*Tensile, Psi*	*Impact, Ft-Lb*	*Creep, In.*
C-3	Metals, wood, ceramics, thermosetting plastics, fibers, etc. Faying surfaces should mate intimately. Adaptable to gauges up to 0.090 in.	2,800 to 3,000	2,800	14 to 17	0.004 to 0.006 at 3/8 ultimate
H-1	Metals to molded materials, wood, thermosetting plastics, certain ceramics, etc.	2,000 to 2,400	1,000 to 1,200	Under test	Under test
CB-1 (with C-3)	Metals to woods, ceramics, thermosetting plastics, thermoplastics, core materials and cyclized rubber. Not recommended for magnesium	Will fail in wood	1,400-1,600 (End-grain birch)	Will fail wood	Negligible
	(Metal to metal)	1,800		OK	0.008 to 0.011
CB-2 (with C-3)	Metals to woods, thermosetting plastics, thermoplastics, rubber and core materials	Will fail in wood	1,700 (End-grain birch)	Will fail in wood	Negligible
CB-4 (with C-3)	Metals, thermosetting plastics, fibers, ceramics, together and in any combination.	2,800 to 3,000	1,600 to 1,900	13 to 17	0.008 to 0.011
LC-67-1	Metals, laminated plastics to core materials	Limited by the core material used			

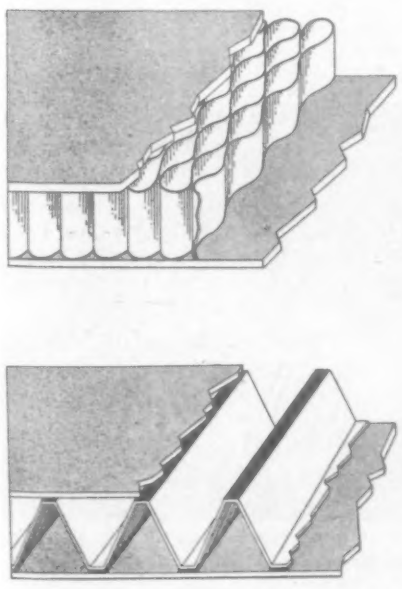


Fig. 2.—Schematic examples of sandwich panels being developed by Chrysler Corp. for Cyclewelding. Above are two light plates joined to a ribbon of light metal shaped in a wavy "S" pattern. Below, the sandwich portion is a corrugation such as is now fastened by spot or seam welding

panels already mentioned—standardized plates joined to the sides of such honeycomb structures or corrugations as are shown in Fig. 2. Particularly insofar as corrugations are concerned, Cycleweld may intrude on a field which up to now has been dominated by spot and seam welding.

Some Possible Applications

These sandwich-type plates may prove to be one of the central lines of development growing out of the Cycleweld process. Present plans call for their production in a series of standardized sizes, complete with joinings. These panels were originally devised for vans used during the war in the South Pacific to house delicate optical and other apparatus which required effective insulation from heat and insects. Now Chrysler is advancing their use for refrigerator floors and panels and has talked about possibilities for prefabricated housing sections.

The advantage of this form of construction lies in the fact that the sandwiched layer of foam rubber, spun glass or other insulation material can be joined over the entire surfaces of the outside plates, which may be of aluminum or other metal. Inasmuch as all portions of the plates help maintain load, their full use may permit thinner outside sections than might be the case if stud-welded or riveted construction were specified.

The equal distribution of load is also the compelling reason why Cycleweld has found adaptations in other spheres. The brake shoe job already cited is one example. Another application is on helicopter rotors, where Cycleweld joining produces a torsional value said to be as much as eight times the value of spot welds formerly employed. Wright Field and aircraft companies are carrying on research programs centered around possible use of Cycleweld for wing and fuselage fabrication.

Design Opportunities

The use of the full value of the sheet may, in fact, work to create a whole new panorama of design thinking and characteristics. Enlargement from this point is limited only by the imagination of the development man. Reduction of weight in vessel superstructures . . . new types of bill-boards . . . home and building panels such as Chrysler is already considering . . . even monocoque constructions for automobile bodies . . . all these and many other horizons may lie ahead in design work which takes Cycleweld into account.

☆ ☆ ☆

All-Welded Luxury Liner

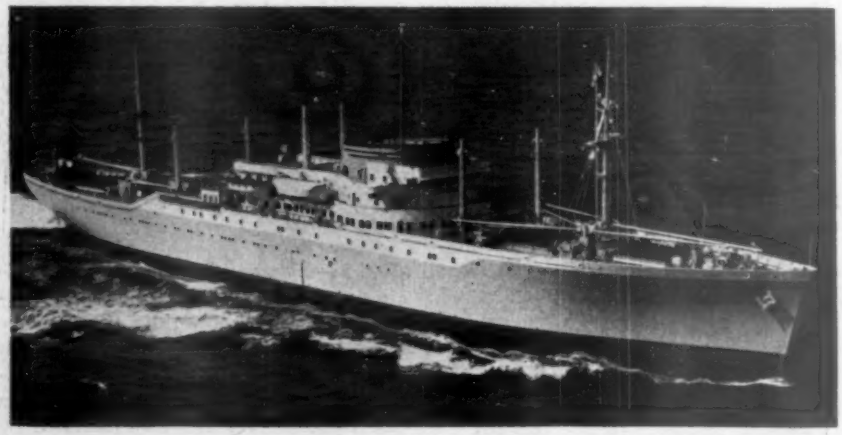
The SS *Del Norte*, new luxury liner for the New Orleans-South American run, is the first of three sister ships being constructed by the Ingalls Shipbuilding Corp. at its Pascagoula, Miss., yard. All of these are welded ships, which is only natural since they come from the first shipyard in the country designed for the exclusive use of the all-welded method of building ocean liners.

The *Del Norte*, along with her sister ships *Del Sud* and *Del Mar*, will be used by Delta Line on 47-day cruises from New Orleans to Buenos Aires and return.

One of the most distinctive features of the 494-ft *Del Norte* is the huge tear-shaped stackhouse which takes the place of the conventional smokestack. The false stackhouse is constructed of aluminum, an innovation, and it has nothing to do with smoke and gases, which will be disposed of high above the deck through two pipes resembling kingposts. Directly below the top of the stackhouse are living quarters for the radio operators as well as radio rooms and an emergency generator.

The *Del Norte* has a modified C-3 type hull together with a cruiser stern and a slightly curved raked stem. Of all-welded construction except for the stack and gunwale angles on the shelter deck, she is a thoroughly substantial ship, subdivided for further safety by eight watertight bulkheads. An additional watertight bulkhead between the number 3 and 4 holds converts her into a two-compartment vessel.

There are six non-refrigerated holds with a capacity of 457,690 cu ft of cargo and a refrigerated hold that can carry 61,390 cu ft. The ship has a length of 494 ft and a breadth of 69 ft, with a total displacement at load draft of 16,715 tons. To maintain her designed speed of 16½ knots or more at sea, she will carry 2,220 tons of fuel oil when the tanks are 98% full.



Del Norte, new Ingalls-built liner, for South American luxury cruises

★ OPERATION

A Loom for Metal Fabric

Highly ingenious in design is a new 25-electrode multiple spot welder which weaves wire mesh at production speeds.

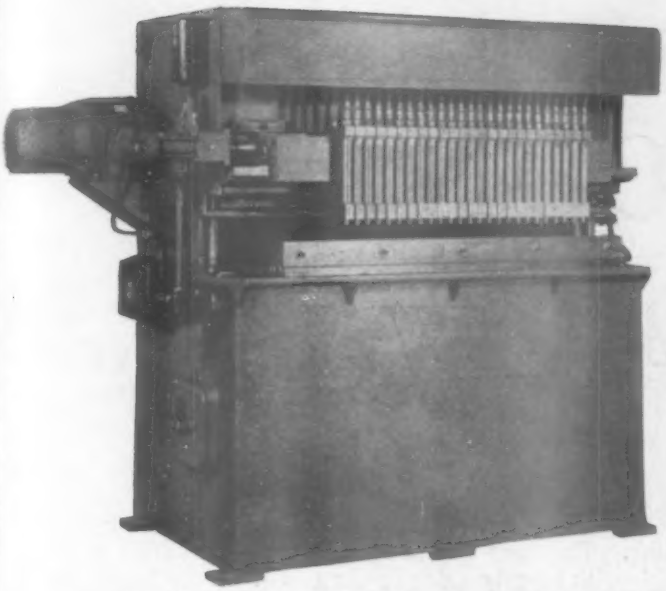


Fig. 1—In many ways, this unique multiple spot welder can be compared to a textile weaving loom

THIS new "loom" is not for the textile industry, for it weaves metal threads into a fabric that is fastened together by spot welds. The threads are wires of diameters ranging from 14 to 0 gauge. The fabric, as you've guessed, is wire mesh, which may be of varied rectangular spacing to meet specific requirements. Finally, the loom itself is a multiple spot welder (Fig. 1), specially designed for just this purpose by the Thomson Electric Welder Co., Lynn, Mass. Fig. 2 illustrates the kind and variety of work it produces.

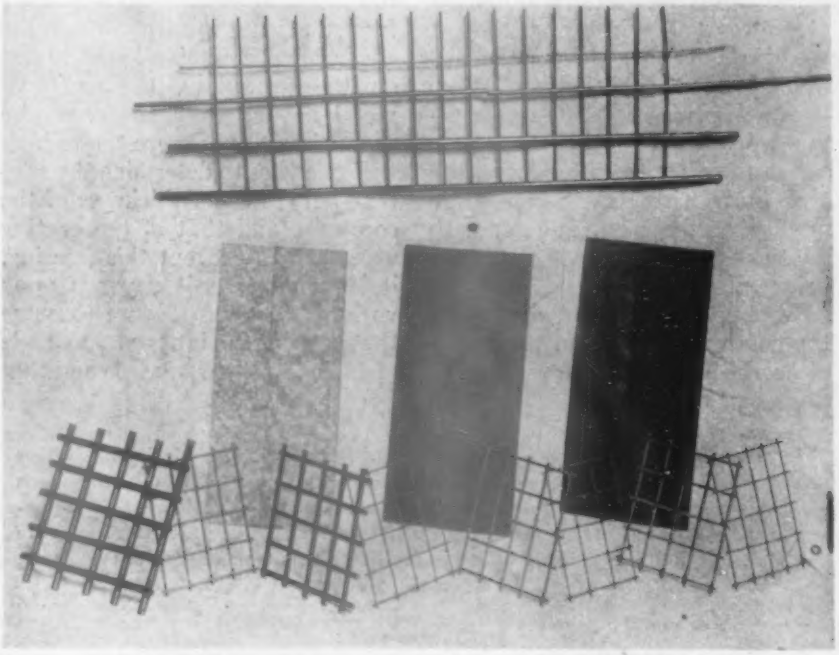


Fig. 2—Wires of many different gauges may be spot welded into wire mesh

25 Wires at Once

The welder has a bank of 25 electrodes, which may be arranged to weld up to 25 longitudinal wires across a maximum width of 48 in. The spacing between welds may be varied upwards from a minimum distance of 1½ in. A shuttle bar operated by a hydraulic cylinder moves the entire bank of electrodes right or left of their initial positions when it is desired to weld succeeding lines in diamond mesh or diagonal weave patterns.

The longitudinal wires, one for each electrode, are fed through the machine continuously while a carriage moves across the machine to weave the transverse wires in their proper positions. This carriage may be likened to the shuttle of an ordinary textile loom. It is designed in two sections, each of which fires half of the electrodes. Current is applied in rapid succession to the pairs of electrodes as the carraige sweeps across the machine. Pressure, on the other hand, is applied simultaneously to all electrodes and maintained during the complete welding cycle.

Both pressure and current timing are individually adjustable for each electrode. Electrodes which are not needed can be blanked out by means of individual cut-off valves.

Spacing, welding pressure and current timing are preset to suit the wire gauge and mesh spacing desired. A floor switch is then tripped to start the cycle, which is carried out under electronic control at high production speed. All of the electrodes (except those previously cut out) contact the work. The two sections of the carriage are driven across the machine by a worm and reversing motor. A solenoid brake automatically stops the rotation of the driving motor at the limit of travel.

Another contact of the floor switch repeats the sequence for the second series of spots. This time, naturally, the carriage moves in the opposite direction.

A Dutch manufacturer has developed a method of touch welding whereby the arc is automatically struck and maintained. This is achieved by transferring a large part of the core metal, in the form of a fine powder, to the coating, which thereby becomes more or less conductive.

CONTACT Arc Welding[1]

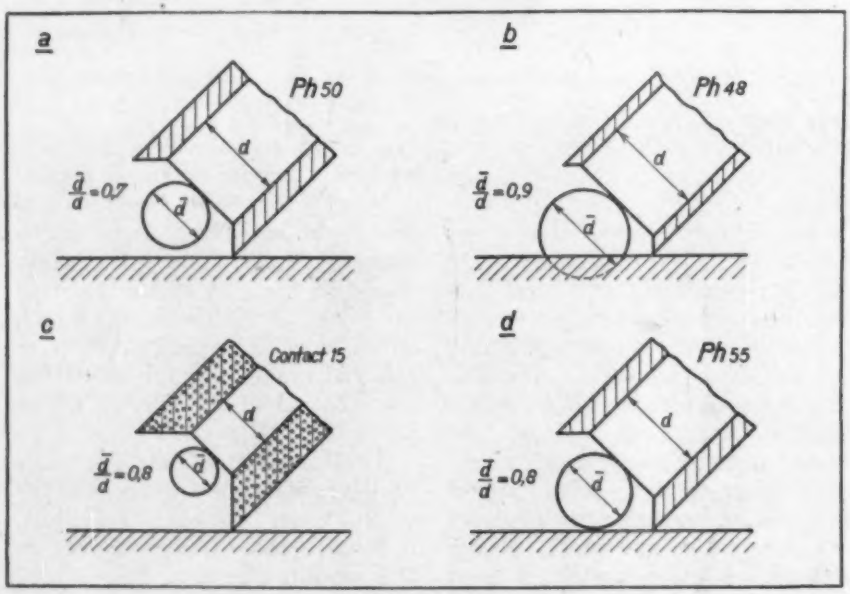
THE great difficulty in manual arc welding has always been in maintaining the arc. The weldor must continually take care that the distance between electrode and workpiece is only a few millimeters (1 mm = 0.039 in.) and that it remains constant. When the distance is too small the rod freezes to the workpiece; *i.e.*, the solidifying drops form a rigid connection. When the distance is too large, the arc burns irregularly and the quality of the work suffers; with a-c there is much chance of the arc being extinguished.

With certain types of electrodes, the coating can rest on the workpiece during the welding; this is called touch welding. This procedure is only possible with heavily coated electrodes, which can be understood when one considers that in welding with a thinly coated rod only a short cup is usually formed around the arc. When the edge of such a cup is allowed to rest on the workpiece, the drops of metal flowing from the core wire short circuit and freeze the rod.

If one tries to determine the relation between the thickness of the core wire and that of the coating necessary to prevent this freezing, it is found that it depends upon various factors. If we assume that the welding is done at an angle of 45 deg to the workpiece and that the cup is formed at an angle of 45 deg to the axis of the electrode, we see from Fig. 1a that the relation between the size of drop of the molten metal and the dimensions of the cup is such that touch welding is just possible with the electrode type Ph 50, while with type Ph 48 (Fig. 1b) it is quite impossible.[2]

The conclusion might be drawn that to make touch welding possible it would be sufficient to give the electrodes a heavy coating. This, however, would be an expensive method, and welding difficulties would occur because of the larger amount of slag. It has never been possible to arrive at a general application of touch welding because of the limitations just mentioned and some others.

Fig. 1—Touch-welding possibilities with four different kinds of Philips electrodes. The diameter of the core wire is indicated by d, that of the drops of molten metal by $\bar{d}$. Disregarding arc craters, touch welding is just possible with Ph 50; not possible with Ph 48 and Ph 55. Contact 15 represents the new electrode created to facilitate this type of welding



Contact Arc Welding

For all these reasons, research work carried out in this laboratory with the object of perfecting the properties necessary for touch welding to such a point that welding could be done with much less trouble and that practically no errors would be made in welding. This includes the requirement that the weld bead should have a flat and uniform appearance. This investigation has now led to a new method of welding for which the name "contact arc welding" was chosen.

Although, in principle, other types of electrodes could have been

[1] Abstract of a paper in Philips Technical Rev. 8, 6, 1946.

[2] The types, "Ph" electrodes and "Contact" electrodes referred to in this article are manufactured by N. V. Philips' Gloeilampenfabrieken, Eindhoven, Holland.

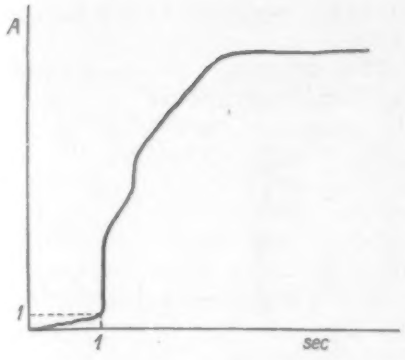


Fig. 2—Oscillogram of the current trend when the arc of a Contact 15 electrode is being established. Note the arc ignites at approximately 1 amp and after 1 sec

★ RESEARCH

BY P. C. VAN DER WILLIGEN

Research Laboratory of N. V. Philips' Gloeilampenfabrieken, Eindhoven, Holland

used in this development, we chose the Ph 55 as a starting point because it has a low oxygen and nitrogen content as well as high ductility and impact value. With the Ph 55, therefore the chance of cracks in the weld is small, an advantage important in the welding of hard steels and also dynamically heavily loaded structures. Moreover, electrode Ph 55 is insensitive within wide limits to the carbon and sulphur content of the workpiece. However, much care is required to make good welds with this type of electrode. If, for instance, the weldor uses too long an arc, porosity may result in the weld. If a welding transformer is used with a low open voltage (<60 v) difficulty is experienced from the extinguishing of the arc.

The electrode Ph 55 had to be altered in such a way as to overcome these objections. The first step was to try to perfect the quality necessary for good touching without increasing the quantity of slag-forming coating material. This was achieved by making the coating heavier by transferring part of the metal of the core in a finely divided form to the coating. A limit is set to the transfer of metal to the coating by the consideration that the core, which has to carry the current, may not be too thin as otherwise the resistance becomes too high and the permissible arc current too low.

In the newly developed "contact" electrodes (so called because they are in continuous contact with the workpiece), about half of the metal of the core is transferred in scattered form to the coating. Fig. 1c indicates diagrammatically that with electrode Contact 15[1] touch welding should be quite easy. The external diameter of the electrode is more than twice as great as the diameter of the core, so that the coating is extremely heavy. For the sake of comparison, Fig. 1d shows an ordinary electrode, Ph 55, which has the same external diameter and the same weight. These two electrodes deposit the same amount of iron in the same time.

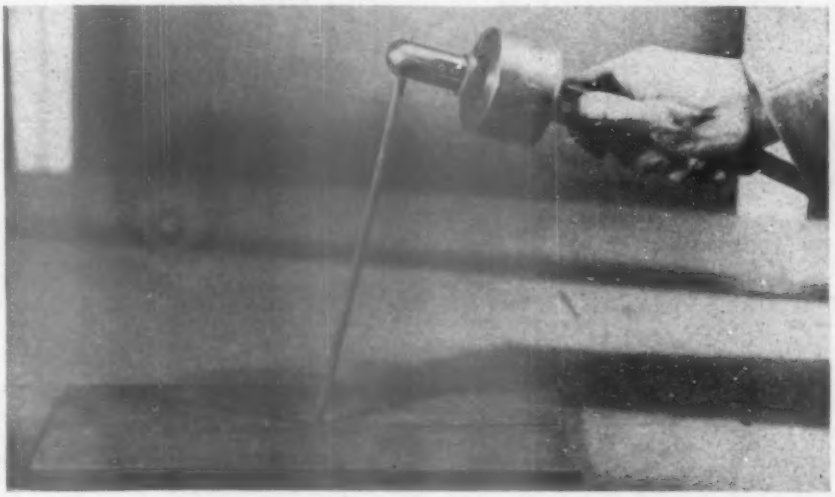
The thickness of the core determines the arc current and, in the case of ordinary electrodes, also the amount of metal deposited per second. In the new Contact 15 electrode, however, only half the molten metal comes from the core, the other half being supplied by the coating. Therefore, the diameter of the core is $\sqrt{2}$ times smaller than that of an electrode Ph 55 depositing the same amount of metal.

With the Contact 15 electrode the ignition (striking) of the arc has also become much easier. It is not done in the usual way by tapping and breaking off the cup but entirely automatically. This simplification in starting is closely connected with the new metallic composition of the coating. The conductivity of the coating is found to have become so improved by the increased metal content that when the coating, under tension, is brushed over the workpiece, sparking occurs (such as takes place from the trolleys or shoes in electrical traction when there is icing). A current is then flowing of the order of magnitude of 0.1 amp. When the coating is not brushed over the edge but is held against a definite spot on the workpiece, the current will rise rapidly and at a value of about 1 amp will suddenly pass to an arc.

The oscillogram of the current flowing with Contact 15 is illustrated in Fig. 2; the arc is usually ignited within one second. When

[1] "Contact 15" is the general class of electrode; the figure appearing after the 15 indicates the core diameter in millimeters. For instance contact 15-5 and contact 15-4 have core diameters of 5 and 4 mm, respectively.

Fig. 3—Special holder for contact arc welding. After the tip is in place on the plate, the weldor presses the thumb button to close the circuit



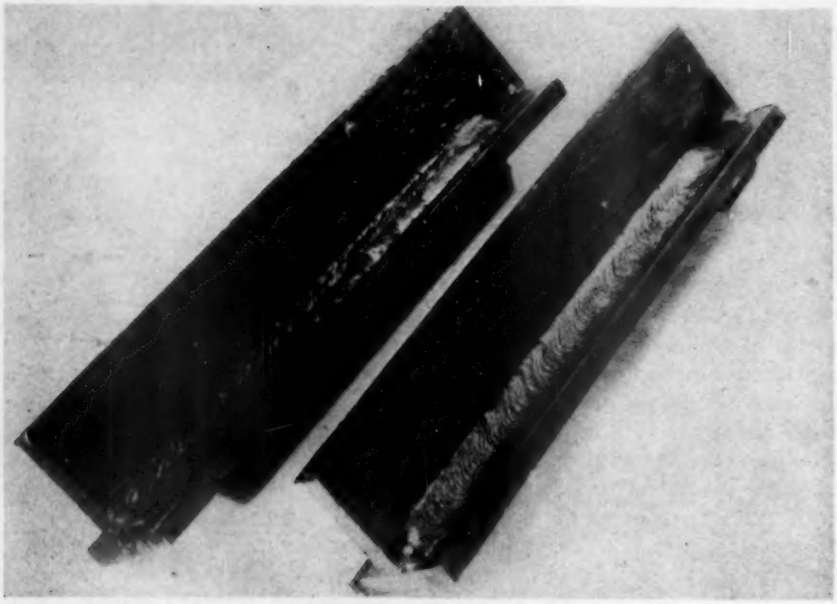


Fig. 4—Flat-position fillet welds made with electrode Contact 15-5. That on the right, made with d-c, has a smoother surface than the a-c (left)

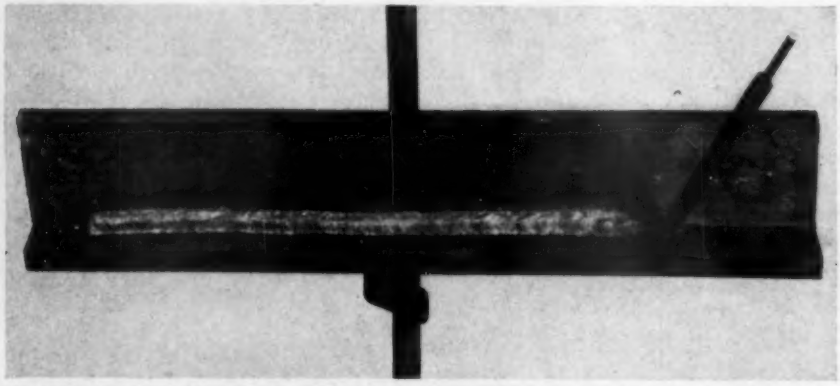


Fig. 5—Overhead welding may be done by both the contact process and by the free arc with contact electrodes. This overhead weld was made with an electrode of 3.25 mm (0.127 in.) core diameter, using 140 amp, d-c

in the hot condition, ignition takes place even more quickly, and obviously the voltage applied also has some influence on the speed of ignition.

Thus the new contact electrode has been made self-starting. Not only has it become unnecessary for the weldor to start by tapping, but the reignition (after an interruption of a few cycles) also takes place automatically.

Use of Contact Electrodes

It is remarkable how easy it is to weld with contact electrodes. This is due not only to the ease of touch welding but also to the self-starting feature. If one must start at a precisely fixed point, it is a great convenience if the starting is automatic. The weldor merely places his electrode tip on the predetermined spot, puts the shield before his eyes and presses the button of the specially designed holder (Fig. 3). This makes welding easier for beginners, too.

Maintenance of the proper arc length when welding has to be done in difficult positions presents difficulties even for experienced weldors. With the newly developed electrodes, the coating has been made so thick that the cup of the rod is always deep and strong enough to keep the core at such a distance from the workpiece that it cannot freeze.[4]

The advantage of contact arc welding is that with a given current the amount of metal deposited per unit of time is considerably greater. And the fact that the arc is for the greater part surrounded by the deep cup diminishes the absorption of oxygen and nitrogen from the air.

The new electrodes also offer important advantages for welding with the free arc. The arc is much less likely to be extinguished, even when the open voltage of the welding transformer is lower than normal. This is probably the result of the conductivity of the coating, which now and then touches the pool.

The mechanical properties of the material deposited by the new electrodes Contact 15 and Contact 18 are found to be similar to those of the corresponding normal electrodes Ph 55 and Ph 48.

Welding Techniques

While it is usual to weld from left to right, welding from right to left also often occurs in practice, and left-handed weldors were desired for such work. With contact electrodes this work (which is no more difficult than melting a candle at a uniform rate against a hot plate) can also be done by right-handed weldors, either with the back of the hand turned towards the workpiece, called "backhand" welding, or by holding the holder in the left hand, which ordinarily can only be done successfully by left-handed weldors.

Just as with normal electrodes, care must be taken to prevent the slag running ahead of the arc. To accomplish this, the angle between electrode and workpiece must not be too large. In the downhand position an angle of 40 to 45 deg is best. If a smaller angle is chosen, there is more sputter. Another disadvantage of a very small angle is that the arc does not dig so well into the root of the weld.

In practice, it sometimes happens that it is impossible to maintain the

[4] In the special case where the electrode is cooled after being partly used, it may happen that non-conducting slag is formed on the edge of the cup and prevents the arc from starting. This slag can, however, be broken off very easily by tapping.

desired 40–45 deg angle; for instance because of the proximity of a transverse partition. It is then possible to weld from right to left or to use the free arc. One can then weld in such a way that the slag remains behind the arc, although the rod makes a large angle with the workpiece.

The most convenient position for making a welded joint is the flat position; this holds true also for contact arc welding, with which very fine results can be obtained. Fig. 4 shows two fillet welds made with Contact 15-5, on the left with 360 amp a-c on the right with 310 amp d-c.

For fillet welds made in the horizontal position, where one plate is horizontal and the other perpendicular to it, Contacts 15-3.25 and 15-4 can be used. With heavier electrodes the weld is strongly convex in form.

A most remarkable feature is the ease with which overhead welding can be done. This is the most difficult position for welding, and, as far as is known, it was never possible to apply touch welding with success in this position. Overhead contact arc welding, however, is found to be very easy. Fig. 5 shows a weld made in this position, using 140 amp d-c. If the weldor prefers to use the free arc, for instance in order to make the weld somewhat wider by means of a weaving motion, the deep cup allows very little material to fall to the ground.

In work on ships, it is often necessary to make a horizontal weld in the vertical plane (the ship's side). This work can be done very well. In vertical-up positions, the electrode should, in general, be moved sideways (weaving) perpendicular to the direction of the weld in order to obtain a sufficiently wide bead, the fused material being left to solidify at the desired spot. In vertical-up welding, the free arc will always be used. Fig. 6 (left) shows a good vertical-up weld made with the free arc, using a welding transformer with an open voltage of only 50 v.

In vertical-down welding, Contact 15 generally gives rise to an excessive amount of slag. The weldor must try to keep the slag above the welding arc because, if it is allowed to run down, it pushes the arc and the molten metal aside, resulting in faults in the surface of the weld. For these reasons an electrode has been developed with a thinner coating, Contact 18. Since the surface of the bead is very smooth, the slag often loosens of itself (Fig. 6, right).

To conclude, we shall make a few remarks about welding with high currents and heavy electrodes, which in the United States is called "hot" welding. The currents used are higher than 600 amp, and the diameters of the electrodes are greater than about 7 mm. As yet, however, this method has not met with much success, for the following reasons:

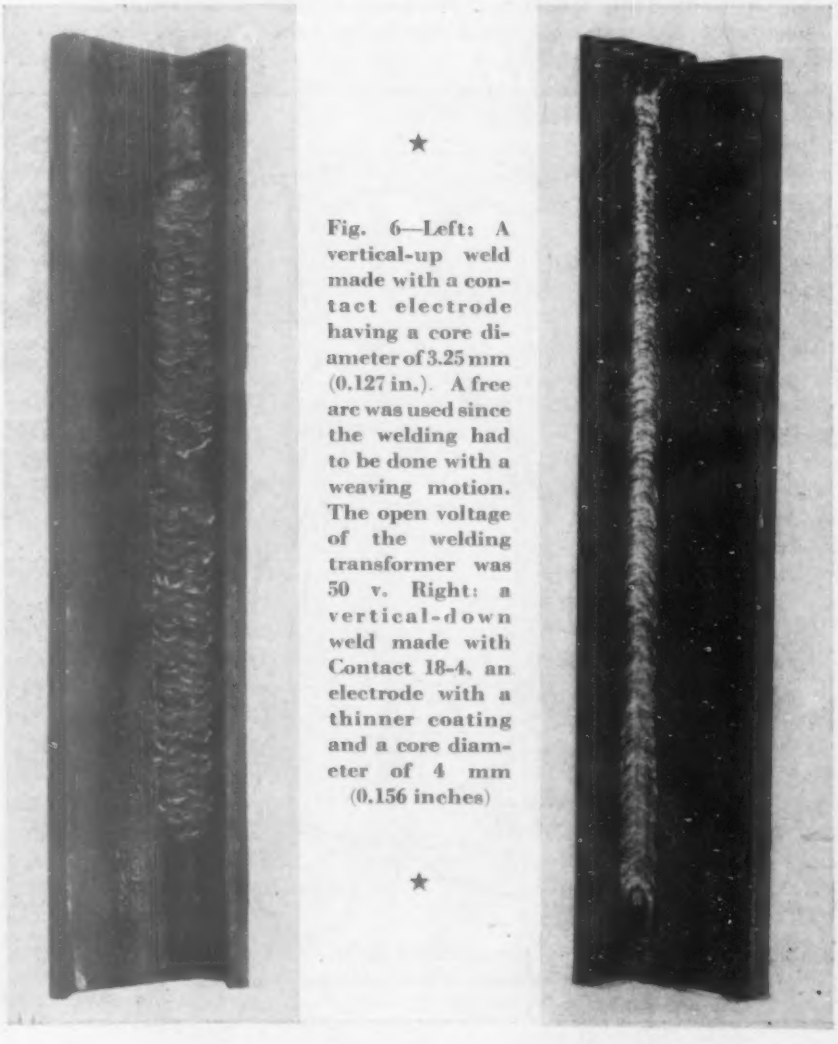
(a) Handling heavy electrodes fatigues for the weldor.

(b) There is much spatter with these rods.

(c) Heat radiation becomes troublesome, especially in hot weather.

(d) Difficulty is very often experienced from undercut, the plate material being burnt away along the toe of the weld.

If Contact 15-6, 15-8 or 15-10 is used (the last has a core diameter of 0.39 in. and is used with a setting of 900–1,200 amp), the first difficulty is overcome since in contact arc welding the electrode rests on the workpiece. Due to the deep cup shielding the arc, spatter is considerably reduced; tests showed spatter losses only one-third of those obtained with the corresponding Ph 55 electrode. For the same reason heat radiation from the arc is lowered, especially in the direction of the weld, since in that direction the cup almost completely shields the arc. Finally, Contact 15 eliminates undercut as a result of its special form of the penetration.



★

Fig. 6—Left: A vertical-up weld made with a contact electrode having a core diameter of 3.25 mm (0.127 in.). A free arc was used since the welding had to be done with a weaving motion. The open voltage of the welding transformer was 50 v. Right: a vertical-down weld made with Contact 18-4, an electrode with a thinner coating and a core diameter of 4 mm (0.156 inches)

★

★ PRODUCTION

Automatic Heaters

Fig. 1—Rolling the tank body. The formed shell will be tacked along the longitudinal seam and welded automatically by the submerged-melt process

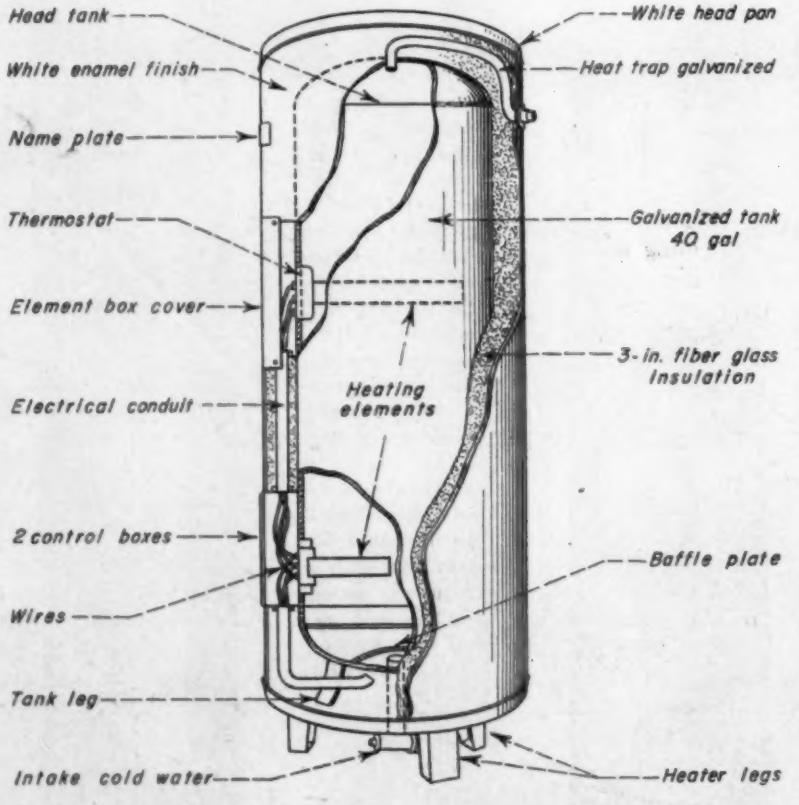


Fig. 2—Sketch showing construction details of a 40-gal water heater. Inner tank is of galvanized steel sheet and outer jacket of aluminum

This Seattle manufacturer didn't get in the electric water heater business until after the war, but his volume has already exceeded the million-dollar mark.

BY M. G. HAWKINS

EFFICIENTLY utilizing wartime production facilities, Seidelhuber Iron and Bronze Works, Seattle, Wash., is manufacturing automatic hot water heaters from rolled sheet stock at the rate of approximately one every four minutes. At the present writing the sales volume has already passed the million-dollar mark.

The Seidelhuber plant originally fabricated ornamental iron, bronze and structural steel. During the war it became a volume producer of ship and plane assemblies. The wartime equipment has been kept intact and specialized new equipment added wherever necessary.

STORING RAW MATERIALS

From the exterior a water heater looks like a very simple piece of apparatus, but its manufacture involves many different materials. The raw materials are obtained wherever and whenever possible under current conditions, inspected for defects and then stacked in readiness for instant use. In storage awaiting their part in the manufacture of an automatic hot water heater are: steel, aluminum, solid bronze sheets, rolls of fiber glass, prefabricated iron and bronze pipe fittings, paint, lumber, brushes, screws, nails, thermostats, heating elements, even the very large paper

Welded Automatically

Fig. 3—Tapping pipe flanges in preparation for the installation of the galvanized heat traps. Aluminum sheets for the jackets may be seen in the background

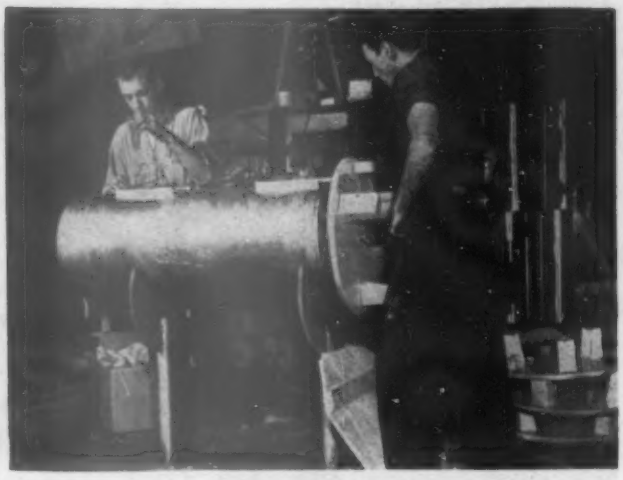


Fig. 4—While one man installs heating elements and thermostats, another affixes the bottom pan of the aluminum jacket to the welded legs of the inner tank

bags that are used to protect the finished product before it is crated for shipment.

All-bronze tanks are made for those communities in which the water contains such corrosive elements as prove injurious to steel. The bronze tanks are made of a silicon-bronze alloy. These tanks are welded manually inasmuch as there has not yet been found a satisfactory method of welding bronze automatically.

In Seattle, galvanized-steel tanks are generally used, and the 40-gallon capacity is the most popular. The cylindrical walls of the steel tanks are of 12-gauge hot-rolled sheets; the heads and bottoms are of 10-gauge hot-rolled sheets. The cylindrical walls of the jackets are of 0.032-in. aluminum, and the head and bottom pans are of 18-gauge hot-rolled steel.

The first step in the manufacture of a 40-gallon steel tank and its jacket is to convey the steel sheets by lift truck to the 12-ft shears. For the tank shell, 12-gauge hot-rolled sheet is squared by the shears to a blank 42 by 50¾ in. The 10-gauge is squared for the 16-in. head and bottom of the tank, and the 18-gauge is squared for the 23-in. head and bottom pans of the jacket.

The 42 by 50¾ in. blank goes from the shears to the bending rolls (Fig. 1), where it is rolled to the required 16-in. diameter for the shell. It is then placed on a specially constructed jig, clamped and manually tacked by a weldor to hold the edges in alignment.

Submerged-Melt Seam Welding

The longitudinal seam is automatically welded by slipping the shell sleeve-fashion over the arm of a submerged-melt welder. The process uses a granular flux that is gravity fed through a tube ahead of the welding arc to protect the hot weld deposit from the atmosphere. The excess flux is vacuum-recovered and screened for reuse.

During the welding time (approximately 25 seconds), another shell is being rolled, tacked and readied for welding. Simultaneously with the forming of the shell, the 16-in. diameter head (or bottom) is being cut and blanked on a 375-ton press with the use of a combination die. The die cuts and blanks the interchangeable head and bottom for the center attachment of pipe flanges and at the same time draws the 1⅝-in. flange and the dome shape. The finished article is automatically pushed out of the die by the action of springs.

With a change of die, the 23-in. top and bottom steel pans of the jacket are cut and blanked, following the manufacture of the head and bottom of the steel tank shell.

The baffle plate is now manually welded in position (see sketch, Fig. 2) to complete the bottom. The bottom and head are inserted in the shell under the pressure of a compressed air cylinder, and the head and top flanges are welded with an automatic welder built in Seidelhuber's own shop. The flanges for the water connections and heating elements are then welded on.

Quick-acting test fittings seal the openings to permit the tank to undergo a rigid hydrostatic test of 300 psi. If it passes this, it is conveyed by roller from the machine shop and loaded upright on roller flats—24 to a flat. The legs are welded on the shells while they are waiting on these flats.

Still on the flats, the tanks are transported by truck to the plant of the Pacific Car and Foundry Co. for galvanizing. Galvanizing, it should be noted, is not done until all welding operations have been completed. The reason for this procedure is obvious: the welding heat would destroy the galvanized coating.

The galvanized tanks are returned to the home plant on the flats to await the synchronized assemblage of inner elements and outer jacket. First, however, the

pipe flanges are tapped as in Fig. 3 to permit the heat trap and cold water intake to be fitted. This is done on a jig adjacent to the assembly-line conveyor.

Welding the Jacket

Timed with the manufacture of the tank shell is that of the aluminum jacket. The cutting and drawing of the cylindrical jacket shell is performed with tools similar

Fig. 5—The "shoe horn" holding the fiber-glass insulation will be lifted out after the jacket has been slipped on over the outside

to those used to form the tank shell. The 0.032-in. aluminum sheet is cut and blanked for the element box panels, and the aluminum blank is then rolled to the desired 23-in. diameter.

The only welding on the aluminum jacket is the longitudinal seam, except in the case of a few models which require an extension collar. Resistance seam welding is used for both of these applications. Because there are no particular stresses upon the aluminum jacket, preweld preparation is confined to wiping the formed sheet with a grease solvent, usually carbon tetrachloride. A thorough degreasing bath is given after welding, however, to assure a grease-free surface for painting.

The top edge of the cylinder is rolled to provide a rim that will serve as a shelf for the flange of the head pan to rest upon. In similar fashion the jacket rests upon the bottom pan, which likewise supports the inner tank.

All of the various fabricated parts now converge upon the assembly line, where in a very few moments the heater comes into being, crated and ready for shipment. The second movement of this manufacturing symphony begins with the installation in the tank of the two heating elements (Fig. 4). The upper element is located at a point just above the center of the tank, and the lower near the bottom (see sketch, Fig. 2). The heating elements are immersed directly into the water, freedom from corrosion and leaks being assured by the use of copper seal-gasket seat faces. A thermostat is installed next to each heating element.

While the tank is still on the jig shown in Fig. 4, the bottom pan of the jacket is bolted to the tank legs. The legs of the jacket are in turn bolted to the bottom pan.

Next the bottom of the crate is attached, and the tank is placed upright on a turntable or pallet that is just the size of the crate bottom.

On the Conveyor Line

Unhurried, harmonic timing prepares the pear-shaped "shoe horn" with a 3-in. lining of fiber glass. The shoe horn is lifted by pulley and momentarily clasped around the inner tank as shown in Fig. 5. The jacket is slipped over the shoe horn, which is pulled out smoothly, leaving the lining snugly fitted around the tank. Hands smooth the lining around the top of the tank and quickly put on the head pan. Then the element box covers are screwed into place.

The pallet with the assembled heater is now conveyed through the water spray booth, where the heater receives two coats of white enamel, evenly distributed in the exact thickness by a spray gun. From the painting booth, it enters a 25 by 5 by 7½ ft bank of infra-red lamps, which bake the enamel for 12 minutes at 275 F.

In its passage through the heat tunnel (Fig. 6), the heater is slowly revolved on the car by an ingenious means. Attached to the bottom of the pallet are teethlike projections which catch in similar teeth stationed at 12-inch intervals on the lower side wall. The ratchet action causes the car to revolve slowly so that the heater has at all times an even distribution of heat upon the top and the shell.

Leaving the bank, the car conveys the heater to the final inspection station, where the name plate and the Underwriters Laboratories' stamp of approval are placed in

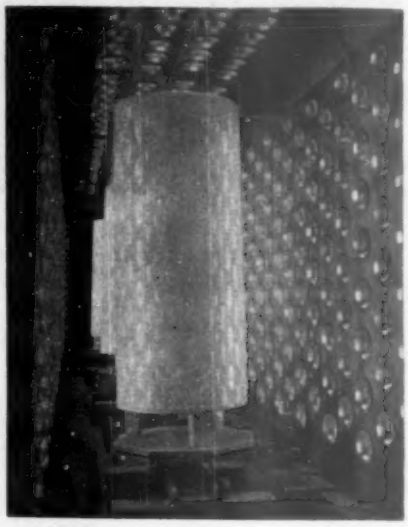


Fig. 6—The paint coat is sprayed on and baked by infra-red lamps. Note how the heaters are revolved as they pass through this tunnel

position. Finally, fingerprints and all other marks are removed and a paper bag such as cleaners use for garments is slipped over the completed heater to preserve its pristine beauty while it is being crated and in transit.

The crated product presents no storage problem. So far the outgo has kept up with production—an average of 125 heaters every 8-hour workday.

New Plant to Be Built

Still faced with material shortages, Seidelhuber is planning a $3,500,000 rolling mill, which is expected to be in operation in 1947 if the necessary building materials can be obtained. Its construction will bring the company's yearly payroll to approximately $2,400,000 and its production facilities up to 300,000 tons.

Fig. 1—The welded framework of a building now used as a brass foundry by the Hays Mfg. Co., Albion, Pa.

Fig. 3—View of the completed brass foundry as seen from the boiler house end of the new welded building

Welded Design for a Brass Foundry

BY C. W. LYTTON

TIME-SAVING construction and low-cost erection were achieved by the welded design of a new building built to house a brass foundry by the Hays Manufacturing Co., Albion, Pa. Constructed of prefabricated trusses and columns, this building has a floor space of 11,645 sq ft. It measures 209 ft long by 52½ ft wide, with a height of 17 ft from the floor to the bottom member of the truss and of 34 ft 7 in. to the ridge of the roof. An addition, 29 ft 8 in. by 35 ft 4 in. was made at one end of the structure to house the foundry boiler.

I-Beams Form Trusses

The trusses were prefabricated by the Rogers Brothers Co., Albion, Pa., and were taken to the job site for welding. These truss members were made out of narrow I-beams that were only 4 in. wide. In order to get the necessary rigidity in the truss, it was necessary to make the top and bottom members fairly deep. The top member is an 8-in. I-beam, the bottom member a 10-in. I-beam. Inasmuch as the columns are 8-in. H-beams, the structure from an end view has the appearance of having a heavier truss than column. Actually, the truss is well designed and has very little deflection.

The original plan was to have a wall of cement blocks installed flush with the columns and to pour a cement housing around each column. However, the engineer in charge of this project decided to put the blocks on the outside of the building, and the 8-in. column now rests on the inside of the wall.

Braces were installed after the trusses were put into position, in the manner shown in the sketch, Fig. 2. The braces were welded in place in the field.

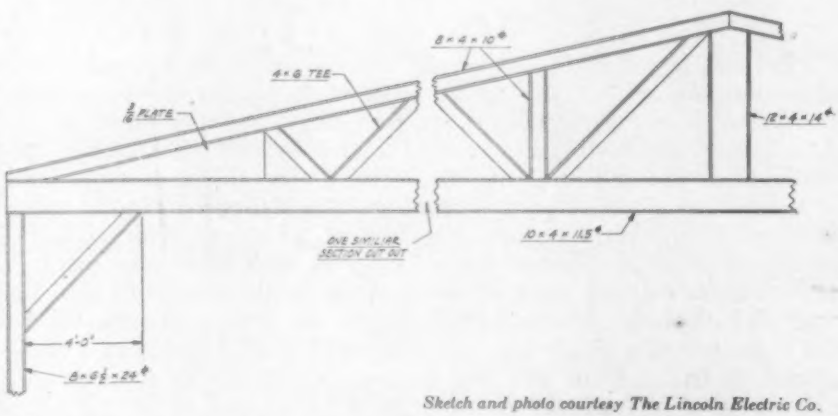
Purlins and Base Plates

The roof purlins are of 2 by 10 in. rough-sawed hardwood lapped on each truss; they are bolted to steel fins, which are intermittently welded every 16 inches to the top truss members.

The foundation for each column is a fabricated base plate having welded to it five notched plate anchors, 2½ by 15 by ½ in. The base plates were placed in piers as the concrete was poured.

Throughout the entire erection, the job site welding operation was done by William Young and Wilson Maxwell, of Albion, in the following sequence: (*a*) columns to base plates; (*b*) trusses to columns; (*c*) braces from columns to trusses; (*d*) window lintels to columns; and (*e*) truck door frame and lintel, 12½ ft wide by 12 ft, 8 in. high. All of the welding was done with 3/16-in. E-6012 electrodes, and two passes were required per joint.

The completed building as viewed from the boiler house end is shown in Fig. 3. A continuous steel window sash, 12 ft high, is embedded in the concrete-block walls.



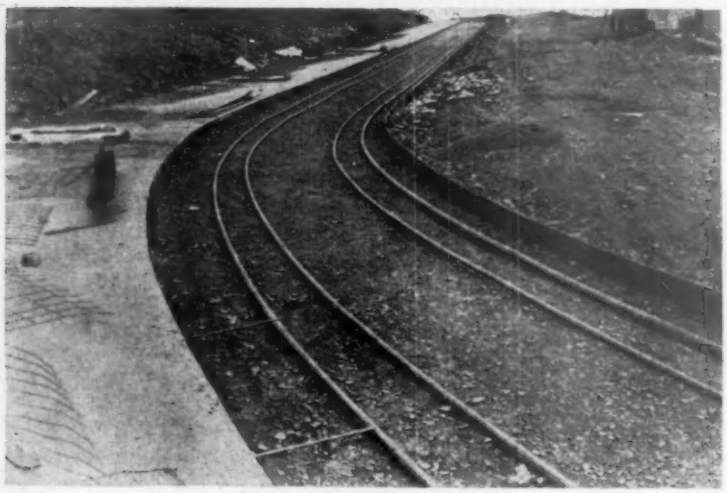
Sketch and photo courtesy The Lincoln Electric Co.

Fig. 2—Details of principal welded connections showing top and bottom trusses and tops of columns. Braces were installed by field welding

Photos courtesy A. M. Byers Co.

Fig. 1 (below)—This two-lane driveway slopes down the side of a hill into the Bridgeville, Pa., plant of American Cyanamid Co. Wrought-iron pipes are embedded in the pavement—four pipe runs for each lane—in order to keep it clear of snow

Fig. 2 (left)—The eight runs of pipe are 600 ft long and are welded at each end to a 4-in. header running across the roadway



★ CONSTRUCTION

Welded Pipes Remove Snow

TO ELIMINATE the traffic hazards caused by winter's snow and ice, engineers of the American Cyanamid Co., Bridgeville, Pa., have designed an effective snow-removal system for a 600-ft, two-lane highway sloping down into the plant. This system consists of welded hot water pipes embedded in the concrete pavement. The structural principles involved in design and installation are somewhat related to those encountered in radiant heating.

Eight Runs of Pipes

Now completed and ready for operation this winter, the snow-melting road is constructed of an 8-in. concrete slab resting on graded earth. Embedded in the concrete at the bottom of the slab are eight lengths of wrought-iron pipe, so positioned as to provide two pipes 18 in. apart beneath each wheel track in both lanes. The pipe runs for a section of a single lane are shown in Fig. 1. These 2-in. pipes are welded at each end of the run to 4-in. wrought-iron header pipes (Fig. 2).

The pipe runs are estimated to provide snow-free, ice-free wheel tracks about two or three feet in width. Heat transferred from the buried wrought-iron pipes to the concrete will warm the pavement sufficiently to melt snow and prevent ice from forming. Residual water will be quickly evaporated from the warm surface by natural air currents.

Water at an average temperature of 165 F will be circulated at a rate of approximately 50 gpm against a head of 17 feet. The water is to be heated by steam from the plant's boilers. Sufficient anti-freeze solution will be added to the system to prevent freezing during periods of non-operation. As insurance against circulatory difficulties, two air vents have been tapped into the piping layout at the highest point, and drainage facilities were installed at a low point.

Under optimum operating conditions, the system is expected to accomplish the removal of a minimum of one inch of snow or one-tenth of an inch of ice per hour. Snowfalls in excess of this rate are "unusual," and it is not considered practical to design such melting systems for greater capacity.

Other Snow-Melting Systems

This radiant system of melting snow is being studied with interest by engineers throughout the country with the idea of eliminating costly manual snow-removal operations. Several department stores in New York City and elsewhere are said to be installing snow-melting systems of this kind to keep their sidewalks clear without the use of chemicals or snow shovels.

Proof that such systems are effective was offered last winter at the Buffalo, N. Y., plant of a rubber company, where wrought-iron snow-melting pipes are embedded in the concrete driveway. The system kept the driveway free from snow during the heaviest snowfall in Buffalo's history when 68 in. fell within a few days.

Automatic snow-melting systems can be made. One manufacturing plant, for instance, has rigged a delicately balanced metal plate that activates the circulator pump whenever snowflakes fall.

Announcing

A NEW CATALOG SERVICE EXCLUSIVELY FOR DISTRIBUTORS OF WELDING EQUIPMENT

Spend only one hour selecting items to be shown — We do the rest — Result —

- A catalog available at all times to present your lines.
- Acts as a silent but efficient salesman.
- Presents an ordering guide in the hands of each customer at a low cost of a few cents per month.
- Describes each item in full with illustrations, prices, factory data and specifications.
- Solicits business by creating additional interest.
- Permits presentation of Non-Stock Items.
- Creates Prestige and confidence in your company by showing at the head of each page your company's name, address and telephone number.
- Lowers operating costs by reducing sales calls

We present ourselves as experienced and capable of producing high quality catalogs. We have complete setups of Welding Equipment and Supplies ready for your particular showing. Your inquiries are welcome at any time.

Photologue Publishing Co.

CATALOG PUBLISHERS

610 W. VAN BUREN ST. - - - - - - - CHICAGO, ILLINOIS

A portion of the exhibit space on the ground floor. The basement was also devoted to metal-working exhibits

28th National Metal Congress

SOME 15,000 persons were in attendance at the 28th National Metal Congress and Exhibition, held November 18 to 22 in Atlantic City's municipal auditorium. There were altogether 418 exhibitors, whose products and processes covered every phase of metal fabrication.

Among the exhibitors occupying the two floors of the auditorium were 57 primary producers of iron and steel, aluminum, magnesium, copper and other non-ferrous metals—manufacturers of tool steels, stainless and high-temperature alloys and alloy steels; producers of bars, rods, castings, forgings, and other shapes. A rough check shows that about 30% of the floor space was taken up by manufacturers of welding equipment or exhibitors in some way closely connected with the welding industry.

An extensive educational exhibit was sponsored by the Resistance Welder Manufacturers Association in which 16 firms participated to display an astounding variety of products manufactured by spot, seam, flash and other resistance-welding processes.

The RWMA shared honors with many other interesting exhibits. One of these was a new oxygen-arc process for cutting and piercing stainless and stainless-clad alloy steels, aluminum, bronzes, brasses, cast iron, Monel, Inconel and nickel. The metal is cut by means of a highly concentrated "pin-point" heat generated by the combination of an electric arc and a stream of oxygen. The latter is supplied through a tubular, flux-coated electrode. The flux is consumed at a slower rate than the core metal, resulting in a continuous "crucible" in which the cutting reaction takes place.

> The recent Metal Congress proved to all concerned that the welding industry is not standing still in the race for more modern methods of production. Some of these examples are cited here.

Demonstrations every half hour of a new coated electrode for automatic welding brought many visitors to the booth of one exhibitor. This electrode consists of a grooved core rod coated with flux and helically wrapped with wire. The exterior wire aids the core metal in maintaining a constant arc, while the flux coating provides an adequate protective shield for the arc and weld metal.

A new spot welder which should prove very useful to the automotive industry for welding bodies, fenders, etc. was shown by a resistance welder manufacturer, who also displayed a new stored-energy flash welder to aid in welding aluminum on a production basis.

While on the subject of aluminum, it would be well to mention the introduction of a new stud-welding gun. Very few visitors missed this novel demonstration of welding aluminum studs to aluminum plates. Next door to this exhibit, an improved form of torch for welding and hard-facing by the powder process was being demonstrated.

About 45 firms were represented in the furnace field, including the well-known manufacturer of the brazing furnace used to make Crosley automobile engines (page 40, this issue). Manufacturers of induction-heating equipment also shared in the limelight and drew crowds at each demonstration of induction hardening or brazing.

Not to be forgotten in this comprehensive exhibition of modern equipment were 43 instrument manufacturers. Coupled with this group were 36 companies who showed materials and processes for metal-cleaning and finishing. There were also those producers who displayed heat-treating equipment, testing machines, machine tools, cutting oils, and every type of equipment or process that plays a part in metal production and fabrication.

These Hard-Faced Mixer Blades Are Still in Service

AFTER 5 YEARS OF USE

This cast-steel mixer blade was hard-faced with HAYNES STELLITE No. 6 welding rod. Protected areas include the leading edge of the 26-in. blade and the stuffing box bearing, 6 in. in diameter.

These hard-faced cast-steel blades—used to mix an unusually abrasive rubber compound—are still out-to-size and in good operating condition after more than 5 years of service.

Before they were protected by a welded-on coating of abrasion-resistant HAYNES STELLITE alloy, the abrasive action of the compound caused the edges and the bearing surfaces of the blades to wear away after a relatively short time. The service life of the unit was approximately 8 months. Hard-facing the blades eliminated the down-time previously required for frequent replacement and, by maintaining operating efficiency at a high level for a long period of time, has brought substantial savings.

It pays to use hard-facing with HAYNES alloys to protect new parts before they are worn, also to reclaim worn parts and protect them against further wear. Write for your copy of "Hard-Facing Materials Data" . . . there is no charge.

A view of the two mixer blades as installed in the 100-gal. mixing tank. After 5 years these blades are still out-to-size and in good working conditions. Unfaced blades lasted about 8 months.

HAYNES TRADE-MARK *alloys*

Haynes Stellite Company

Unit of Union Carbide and Carbon Corporation

UCC

General Offices and Works, Kokomo, Indiana

Chicago — Cleveland — Detroit — Houston — Los Angeles — New York — San Francisco — Tulsa

The registered trade-marks "Haynes" and "Haynes Stellite" distinguish products of Haynes Stellite Company.

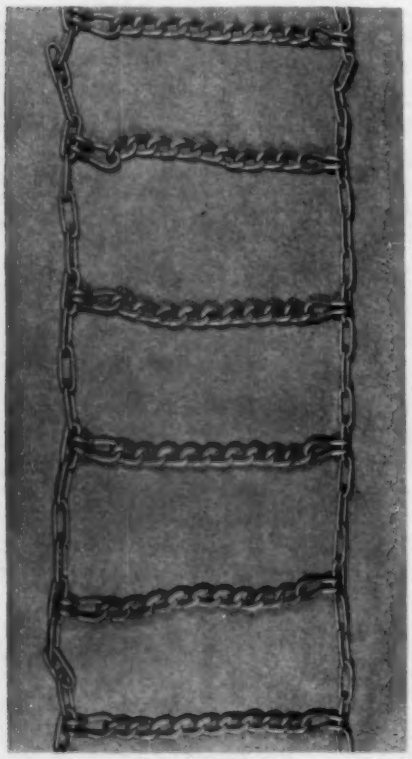
Short Cuts and Kinks

Hard-Facing Tire Chains

IN SECTIONS of the country where tire chains are widely used during the winter months, the welding shop can create an excellent volume of business for itself by specializing in the hard-facing of tire chains.

Tire chains properly hard-faced will last between two and three times as long as new chains. The cost of hard-facing is usually about the same as the cost of a new set. An additional advantage is that hard-faced chains give better traction on icy roads, particularly when they are overlaid to operate under these conditions.

The usual procedure in hard-facing chains to be used on icy roads is to bring the overlay to a point. Chains so hard-faced dig into the ice and supply excellent traction as well as non-skid stopping. If the chains are to be used in urban areas where the streets are sometimes bare, the overlay is flattened for more wear and smoother riding.



Courtesy Wall-Colmonoy Corp.

Hard-faced tire chains outwear new ones, make for safer driving on icy roads. This very profitable job for the welding shop will appeal to fleet owners

Any ideas for this section? Send them to THE WELDING ENGINEER, 520 N. Michigan Ave., Chicago 11. Payment made at our usual rates.

The job of hard-facing chains is quite simple. The area on the chain where the overlay is to be applied is first lightly ground. A boron-carbide type of hard-facing alloy is then applied by oxy-acetylene welding in much the same way as Tobin bronze. The overlay is gradually worked to the shape desired.

As a rule, only the five center links of each cross-section need to be hard-faced since these are the only ones that come in contact with the road. The chains can be welded on a welding table, or, if the work is to be put on a production basis, a rotary drum can be made. In the latter case, the chains are locked around the drum and welded a number at a time.

The procedure is to hard-face the five or six inner links of each cross-section one after the other. Then all of the links are heated to about 1,500 F and water quenched. In this way, hardness and tensile strength are maintained throughout the links. The quench does not hurt the overlay. On a set of 6 × 16 solid chains about 13 oz of $\frac{3}{16}$-in. hard-facing filler rod will be required.

The total time needed to grind, apply the hard-facing and quench is about one hour and five minutes for either worn or new chains. There is no limit to the number of times that chains may be hard-faced, provided they are not worn to the point where the links break.

* *

Vertical Flame-Cutting

By George E. Marz and Arthur K. Thompson

IT HAS always been difficult to make vertical flame-cuts or cuts on steeply inclined plates. Not only is the operation a time-consuming one, but the resulting cuts are frequently ragged in appearance. To overcome this difficulty, we submitted a suggestion under the Navy Employee's Suggestion Program for the attachment of a hydraulic device to actuate a flame-cutting torch. Its use is estimated to have saved $6,000 in the Mare Island navy yard.

Our machine consists of a hydraulic pump-and-piston arrangement driven by a variable-speed electric motor. The oil reservoir was mounted in the base of the machine to make it a compact unit. The torch holder is attached to the hydraulic piston and runs along guides on the outside of the vertical cylinder. The piston and cylinder are so mounted on the base as to be adjustable in two directions: on angles from vertical to horizontal and radially through a major part of 360 degrees. If desired, the piston unit may be removed from the base and clamped into position on the plate being cut.

Fig. 1 shows the machine in operation and Fig. 2, a close-up view of the torch, shows the variety of vertical cuts and bevels it is capable of making.

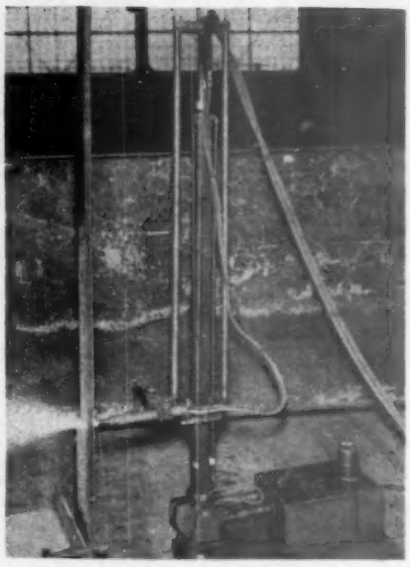


Fig. 1—Hydraulically driven machine for vertical or steeply inclined flame-cuts

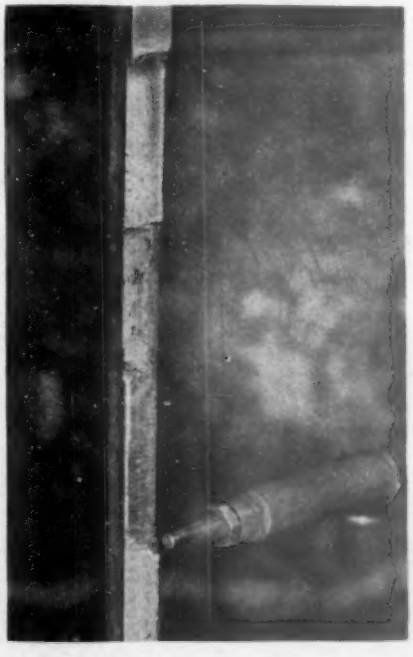


Fig. 2.—Note the smoothness of these cuts

Induction and Dielectric Heating Data*

(*Radio-frequency heating rate; lb per minute*)

Temp. Rise, F	Specific Heat	Energy in Kilowatts						
		2	5	10	20	50	100	200
200	.2	2.84	7.10	14.20	28.4	71.0	142	284
	.3	1.89	4.73	9.46	18.9	47.3	94.6	189
	.4	1.42	3.55	7.10	14.2	35.5	71.0	142
	.5	1.1	2.8	5.7	11.1	28	57	110
225	.2	2.52	6.30	12.60	25.2	63.0	126	252
	.3	1.68	4.20	8.40	16.8	42.0	84.0	168
	.4	1.26	3.15	6.30	12.6	31.5	63.0	126
	.5	1.01	2.52	5.05	10.1	25.2	50.5	101
250	.2	2.27	5.68	11.36	22.7	56.8	113.6	227
	.3	1.52	3.80	7.60	15.2	38.0	76.0	152
	.4	1.14	2.85	5.70	11.4	28.5	57.0	114
	.5	.91	2.28	4.56	9.1	22.8	45.6	91
275	.2	2.07	5.17	10.34	20.7	51.7	103.4	207
	.3	1.38	3.45	6.90	13.8	34.5	69.0	138
	.4	1.03	2.58	5.16	10.3	25.8	51.6	103
	.5	.83	2.03	4.06	8.3	20.3	41.5	83
300	.2	1.89	4.73	9.46	18.9	47.3	94.6	189
	.3	1.26	3.15	6.30	12.6	31.5	63.0	126
	.4	0.95	2.38	4.76	9.5	23.8	47.6	95
	.5	0.75	1.88	3.76	7.5	18.8	37.6	75
500	.2	1.14	2.84	5.68	11.4	28.4	56.8	114
	.3	.76	1.89	3.80	7.6	19.0	37.9	76
	.4	.57	1.42	2.85	5.7	14.2	28.4	57
	.5	.45	1.14	2.28	4.6	11.4	22.8	45
1,000	.2	.57	1.42	2.84	5.7	14.2	28.4	57
	.3	.38	.95	1.90	3.8	9.5	18.9	38
	.4	.28	.71	1.42	2.8	7.1	14.2	28
	.5	.23	.57	1.14	2.3	5.7	11.4	23
1,500	.2	.38	.95	1.89	3.8	9.5	18.9	38
	.3	.25	.63	1.27	2.5	6.3	12.6	25
	.4	.19	.47	.95	1.9	4.7	9.5	19
	.5	.15	.38	.76	1.5	3.8	7.6	15
2,000	.2	.29	.71	1.42	2.8	7.1	14.2	29
	.3	.19	.47	.95	1.9	4.7	9.5	19
	.4	.14	.36	.71	1.4	3.6	7.1	14
	.5	.11	.28	.57	1.1	2.8	5.7	11

*Courtesy Industrial Electronics Div., Westinghouse Electric Corp., Baltimore, Md.

Nothing Finer Ever Made in a Cutting Torch

The **NEW** *Super* **CUTMASTER**

using 4 different Cutting Heads

With the New Super CUTMASTER your cutting problems are over, for while it is recommended primarily for fabrication work, it is equally well adapted for All Purpose cutting as is ordinarily found in assembly factories, rolling mills, scrap yards, railroad shops, etc. – the four different angle cutting heads – 90°, 75°, 45° and straight provide for quick and accurate work.

JUST CHECK THESE ADVANTAGES

1. A new-type Patented mixer that will save gas . . . pre-heats quicker.
2. Perfectly balanced . . . easier to handle.
3. Monel metal tubes . . . heat resistant.
4. Velvet-touch poppet valve lever with thumb operated locking device.
5. *Forged* heat and valve body . . . stands abuse better . . . wears longer.
6. All Tips precision drilled . . . sizes 00 to 6 . . . six pre-heats and in sizes 1 to 6. Unit construction . . . long wearing.
7. Patented method of tip connection eliminates all problems of leakage and hazard.
8. Patented spring tension needle valves, perfect adjustment at all times.
9. Rigid 3-tube construction.

IT PAYS TO WAIT FOR A Meco

No matter what Welding or Cutting Equipment you use – or need – it will pay you to wait for a Meco. We are increasing our production as rapidly as possible and hope soon to be able to take care of your requirements *promptly!*

Meco

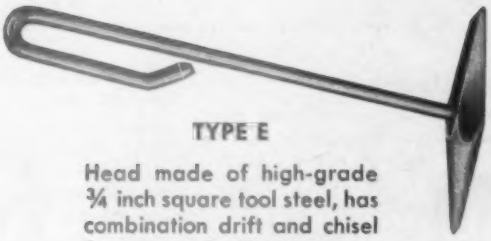
MODERN ENGINEERING COMPANY, INC.

3411 WEST PINE BLVD. • ST. LOUIS 3, MISSOURI

USE CMD HAMMERS FOR *Every* WELD CLEANING NEED!

TYPE A

Drift and Chisel. Made from high-grade tool steel. Popular in malleable iron and grey iron foundries for general chipping.

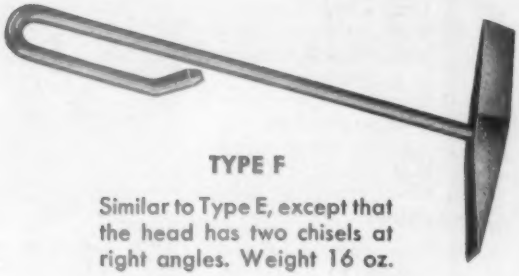


TYPE E

Head made of high-grade ¾ inch square tool steel, has combination drift and chisel for general chipping purposes. Special hand grip absorbs shock. Weight 16 oz.

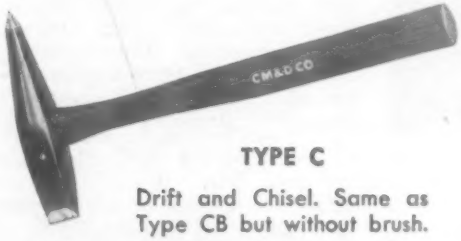
TYPE CB

Triple Duty. Combines 3 tools in 1—drift, chisel, and removable wire brush.



TYPE F

Similar to Type E, except that the head has two chisels at right angles. Weight 16 oz.

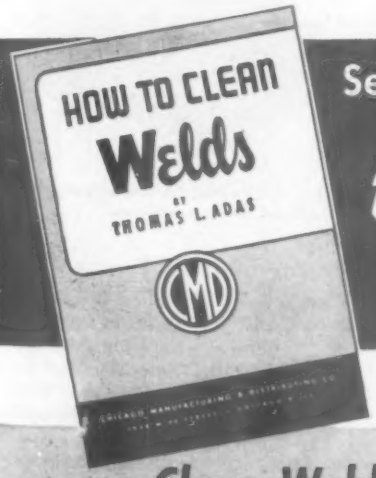


TYPE C

Drift and Chisel. Same as Type CB but without brush.

TYPES EB and FB

Models E and F can be supplied with brush as shown here. Brush can be replaced.



Send For This **FREE BOOKLET** TODAY!

Authentic information for experienced and apprentice weldors.

Order CMD Hammers from your local welding supply house.

Chicago Manufacturing & Distributing Co.
1928 West 46th Street, Chicago 9, Ill.

Please send without obligation _____ copies of the booklet "How to Clean Welds."

NAME.....

FIRM NAME.....

ADDRESS.....

CITY.....ZONE.....STATE.....

Clean Welds Mean Sound Welds — Lasting Satisfaction

New Products to Use

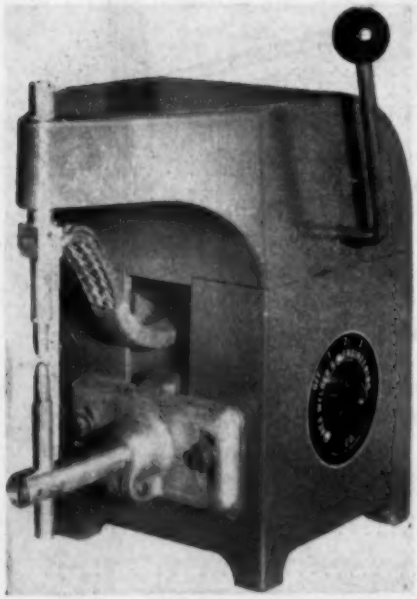
To Secure Additional Information, Turn to Page 71

Cone-type Electrode

29 A LINE of truncated-cone type spot-welding electrodes is said to offer many advantages for all-round spot welding. Heat generated during welding is dissipated more rapidly and mushrooming is reduced to a minimum by this electrode contour, states manufacturer. Restoration of the original contour is a simple, low-cost operation. The electrodes conform to AWS tentative standards. P. R. MALLORY CO., INC., Indianapolis.

Truncated-cone spot-welding electrodes are said to minimize mushrooming and facilitate dressing operations

* *

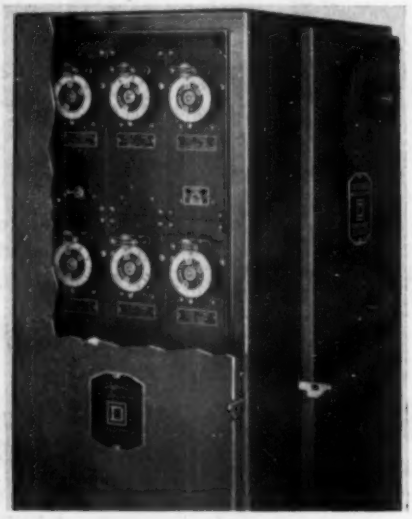


Rex "Junior" press-type spot welder has a capacity of two sheets of 24-gauge CRS

Spot Welder

30 REX "Junior," a 1-kva press-type spot welder, operates from a 110-volt source and has a capacity for welding two sheets of 24-gauge cold-rolled stock. The lower face plate and electrode holder are adjustable up or down. The holders accommodate any No. 1 Morse taper tips. Operation is by a hand lever, although a foot switch is supplied for production use. A four-point heat control switch is standard for heat adjustment. Another feature is an air-cooled transformer. REX WELDER & ENGINEERING CO., Kansas City, Mo.

* *



Square D's combination welder control

Welder Control

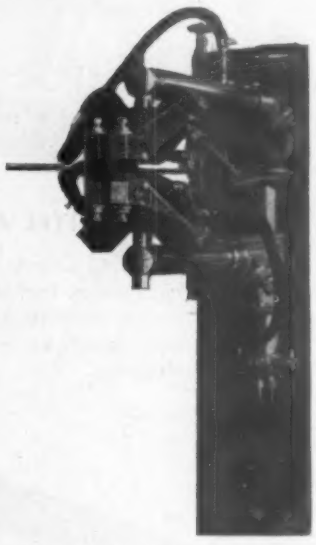
31 FULLY automatic control of air operated resistance-welding machines is provided in a new combination control unit (Class 8992). The contactor and sequence timer are included in a single enclosure arranged to mount on the right-hand side of the machine so that all controls are within reach of the operator. Foot switch, pressure switch, no-weld switch and timer control circuits operate at 110-volts and are isolated from the power supply to give added safety. Controllers have tapped primary control transformers which can be connected for operation at 110, 220, or 440-volts, 60 cycles; or for 380-volts, 50 cycles. SQUARE D CO., Milwaukee 12.

* *

Electronic Timer

32 A NEW automatic electronic timer (type 30HL1) is recommended for such equipment as spot welders, grinders, drilling machines, etc. The unit provides four basic types of timing: interval, delayed action, automatic repeat and programming. It is capable of timing for any interval between $\frac{1}{20}$ second and four minutes with an accuracy variation of less than 2%. Either a 115 or a 230 volt supply line may be used. PHOTOSWITCH INC., Cambridge 42.

* *



"Butt-on-Spot" attachment converts spot welders to butt welders

Spot Welder Converter

33 "BUTT-ON-SPOT" is the name of an attachment which converts spot welders to butt welders for wires or thin-gauge sheet metal. This is accomplished by removing the tip holders and inserting the attachment as pictured. A minimum horn clearance of 7 in. is necessary. The attachment has alternate face plates of heat-treated copper alloy and serrated tempered steel. ROBERT W. HOFFMAN CO., Chicago.

* *

Aluminum melting furnace available in 50 and 100 lb capacities

Aluminum-Melting Furnace

34 THIS aluminum-melting furnace is gas or oil fired and fulfills the medium production requirements of pattern shops, smaller foundries and as supplemental equipment for large factories. Aluminum can be melted in and poured directly from the heat-resisting alloy-metal pot, which is designed to keep gases away from the surface of the molten metal. The furnace can also be equipped for occasional melting of brass. THE KINDT-COLLINS CO., Cleveland 11.

Pressure Gauge

35 A NEW gauge designed to fit into tight spots can be used to check mechanical pressure between spot-welding electrodes as well as to check pressures between platens in hydraulic presses and to check the accuracy of Brinell hardness

Pressure gauge for measuring pressure between spot-welding electrodes

testers. The gauge is available in six models: 0–100 lb, 0–250 lb, 0–500 lb, 0–1,000 lb, 0–2,500 lb and 0–5,000 lb. Weights range from 1¼ to 2⅜ lb. W. C. DILLON & Co., INC. Chicago 44.

* *

Catalog Service

36 A SPECIAL service is being offered to distributors of welding equipment and supplies, by PHOTOLOGUE PUBLISHING CO., Chicago. With copy already compiled on thousands of items of welding equipment, very little effort on the part of a distributor is required to pick out the lines and items he wants for his own particular catalog. Features of the service are: (1) it presents an ordering guide in the hands of each customer; (2) it describes each item in full with illustrations, prices, factory data and specifications; (3) it permits presentation of non-stock items; (4) it lowers operating costs by reducing sales calls.

* *

Nickel-Silver Rods

37 Two nickel-silver welding rods have been added to the All-State line. One of these is recommended for production fabrication of light steel and nickel-alloy sections, including stainless steel copper-nickel and nickel. The other is recommended wherever resistance to frictional wear is desired and for build-ups on worn or broken parts. ALL-STATE WELDING ALLOYS CO., INC., White Plains, N. Y.

Do you know that the life of your forging dies can be extended?

Typical repair to forging die with Eureka "Drawalloy" electrodes.

Plow-share forging die refaced with Eureka "Drawalloy" electrodes.

Save tons of forging dies and untold man-hours by eliminating resinking operations! Eureka "Drawalloy" welding electrodes do the trick by ***rebuilding to original dimensions*** the contours of forging dies that have heat-checked or spalled!

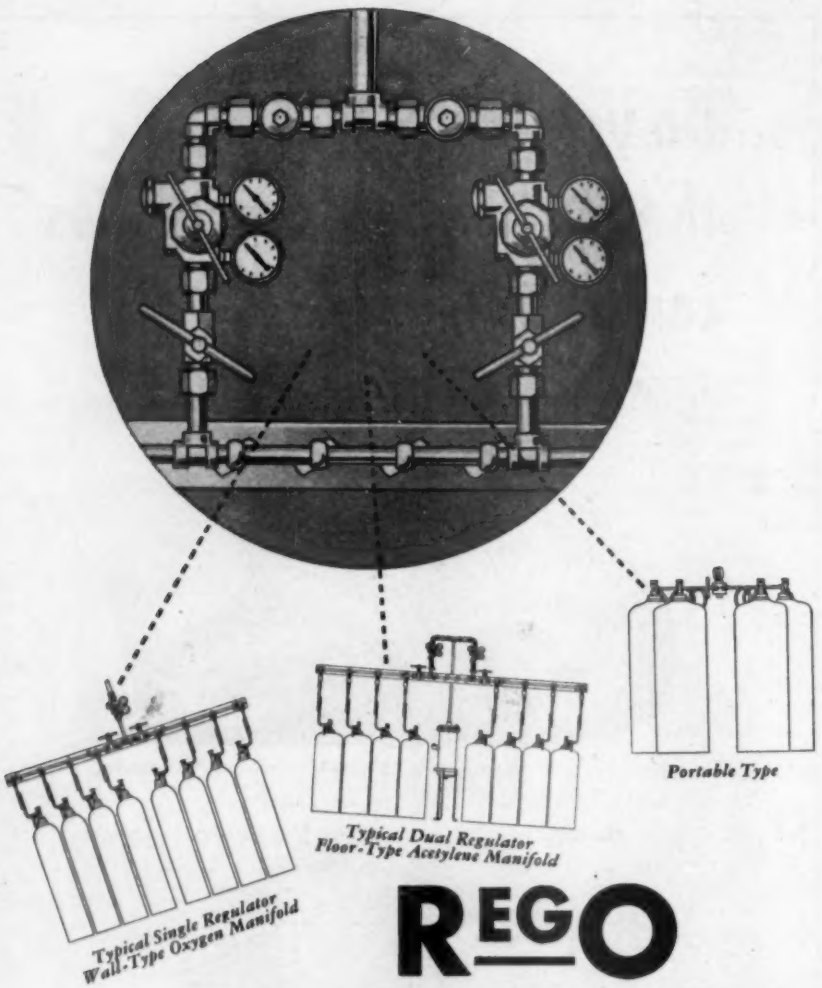
You can efficiently rebuild defective forging dies with "Drawalloy" electrodes and *welded deposits will match the characteristics of typical forging block steel!* Welded and adjacent areas can be machined to the original dimensions of the die! Also effectively used for die repair. Send today for full descriptive literature. No obligation.

EUREKA TOOL AND DIE WELDING ELECTRODES

Welding Equipment & Supply Co.

PIONEERS IN TOOL AND DIE WELDING ELECTRODES

223 LEIB STREET • FITZROY 3715 • DETROIT 7, MICHIGAN


Portable Type
Typical Dual Regulator Floor-Type Acetylene Manifold
Typical Single Regulator Wall-Type Oxygen Manifold

REGO

DESIGNED MANIFOLDS

To meet your Exact Requirements!

● RegO Manifolds are designed in a wide range of types and sizes to meet virtually every requirement. They are RegO-engineered to give peak efficiency, convenience and safety. RegO Manifold installations and related Gas Plant Equipment are specified as standard by major companies throughout the country.

REGO MANIFOLDS *for* Oxygen
Acetylene
Hydrogen
Nitrogen
and other high pressure gases

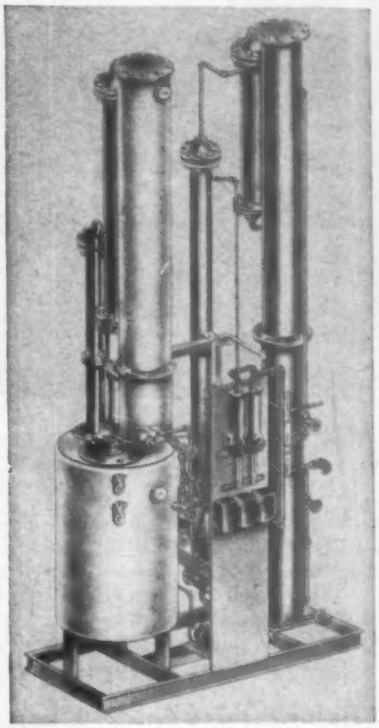
The BASTIAN-BLESSING Company

4201 W. Peterson Avenue Chicago 30, Illinois

Pioneer and Leader in the Design and Manufacture of Precision Equipment For Using and Controlling High Pressure Gases

Neutralene Gas Producer

38 A "NEUTRALENE" gas producer provides a dry and neutral atmosphere for such operations as: heat treating medium and high-carbon steels without decarburization; furnace brazing, bright annealing; clean hardening medium and high-carbon steels; hardening high-speed steels; sintering of high-carbon ferrous metals. A typical mixture for brazing, heat treating or sintering consists of about 10.5% carbon monoxide, 15% hydrogen, 1.5% methane and 73% nitrogen.



Neutralene gas producer for brazing, heat-treating, without decarburization

The unit consists of a combined combustion chamber and reactivating tower, absorbing tower to remove carbon dioxide, gas cooler, heat exchanger and liquid cooler. For drying the gas, a refrigerated gas cooler and activated alumina dryer are furnished. APPARATUS DEPARTMENT, GENERAL ELECTRIC Co., Schenectady, N. Y.

* *

Liquid Adhesive

39 A NEW industrial liquid adhesive (No. 4665) bonds metal foils and metal sheets to wood, plastics, vulcanized, synthetic and natural rubbers, etc, without the aid of a catalyst or special preparation. It can be applied without thinning by brushing, roller coating, knife coating or dipping. Its bond strength is lowered by continued immersion in water, but regained upon drying. It is resistant to dilute alkalis and acids and has no tendency to gel. FINISHES DIVISION, E. I. DU PONT DE NEMOURS & Co., Wilmington 98.

Thousands of Manufacturers NOW get *Higher Production at Lower-Cost* with SIL-FOS and EASY-FLO

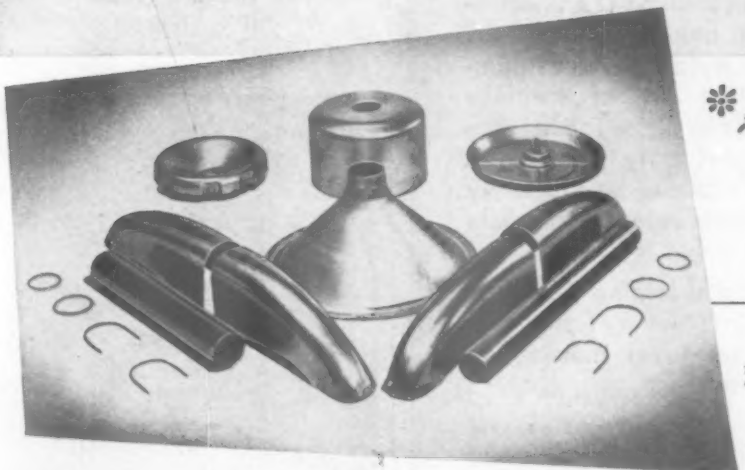
SIL-FOS and EASY-FLO have skyrocketed production and cut costs on an amazing number of metal joining jobs.

By preplacing these brazing alloys and using fast handling and heating methods, metal joining in hundreds of cases has become a fast mass production operation.

Their ability to join stampings and tubular parts with one-piece strength has revolutionized the design of many products* with big savings in man-hours, machine-hours and metals.

Investigate the increased production and cost savings SIL-FOS and EASY-FLO brazing can give you. For quick action—ask for a free demonstration and recommendations in applying these alloys. Ask especially for details about the new, faster acting, lower cost EASY-FLO 45.

BULLETINS giving all the facts will be mailed on request. Write for them today.

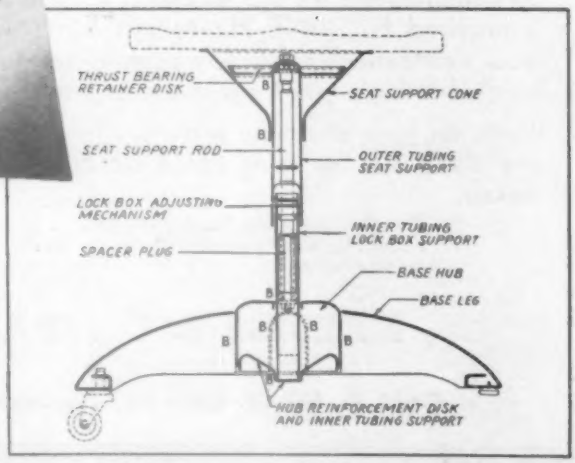


Above are the makings of the chair—8 steel stampings, 2 pieces of steel tubing, and four rings and four U-shaped pieces of 3/64" EASY-FLO wire which join them. Assemblies with the alloy preplaced are positioned and held in simple fixtures for brazing with gas-air burners. Letter B marks the location of brazes. *Production—50 chairs an hour.*

*A Typical Example

STEEL CHAIR FOR STENOGRAPHIC AND INDUSTRIAL USE

Designed and Produced by
Kewaunee Mfg. Co., Adrian, Mich.



HANDY & HARMAN

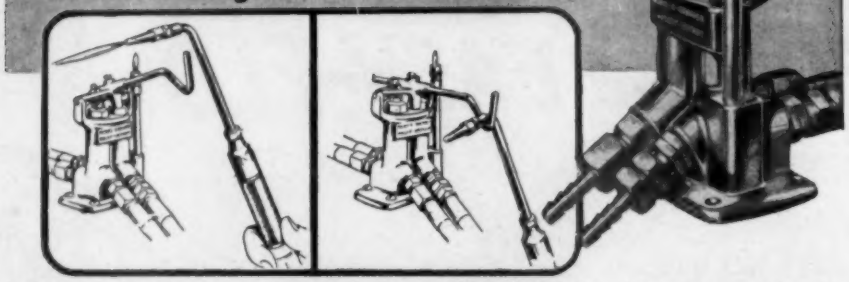
82 FULTON ST., NEW YORK 7, N. Y.

Bridgeport, Conn. • Chicago, Ill. • Los Angeles, Cal. • Providence, R. I. • Toronto, Canada

Agents in Principal Cities

WELDIT GASAVER

● Cuts Gas and Oxygen Cost!
● Eliminates Dangerous Fire Hazard!



With Weldit Gasaver installed the operator simply hangs his torch on the handy lever rod of the Gasaver. The weight of the torch pulls the lever rod down, closing the valves of the Gasaver, thus shutting off both gas and oxygen intake lines. The usual idle flame and needless waste of oxygen and gas between operations is thus eliminated—no fire hazard or danger of injury to workers.

When the torch is again picked up for further welding operations, the operator passes it across the pilot light of the Gasaver, thereby instantly igniting the torch at the pre-adjusted flame, ready for work — no adjustments to make.

Gasaver can be installed any convenient place on the line between regulators and torch. Most of America's largest production plants are now Gasaver equipped.

Listed as standard by Underwriters' Laboratories and by New York City Board of Standards and Appeals.

Weldit INC. SINCE 1918

ORDER YOURS TODAY

994 OAKMAN BLVD. • DETROIT 6, MICH.

"FLUXINE" Fluxes are the result of over fifty years of scientific research into the metal-joining field. There are 89 FLUXINE Fluxes . . . one for every welding, silver soldering, brazing, and soft soldering operation . . . each with its own properties, designed for a particular metal-joining operation. All have been perfected not only for highest efficiency, speed, and long life, but for economy and safety as well. FLUXINE Fluxes cause no injurious fumes to irritate eyes or nose of the operator.

So confident are we that wherever a metal-joining operation is required FLUXINE Fluxes will do it better, faster, and more economically than any competitive fluxes, that we will be glad to have you try it at our expense.

Write on your company letterhead for a generous sample and directions for using FLUXINE Fluxes on 57 different metals.

Ask your jobber for Fluxine Fluxes . . . he knows the FLUXINE line produces the best results with the greatest economy.

KREMBS & COMPANY
Est. 1875
Dept. G, 669 W. Ohio St., Chicago 10, Ill.

FLUXINE

FLUXES TO JOIN ALL METALS

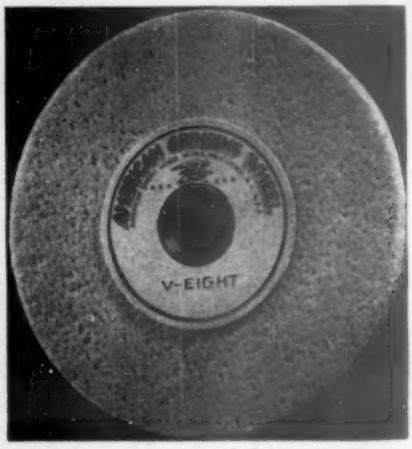
TRADE MARK REGISTERED U. S. PAT. OFF.

"Ergolyte Junior" dual purpose welding kit for jobs in machine and garage shops

110-Volt Welder

40 "ERGOLYTE JUNIOR", is an 80-amp a-c welder that operates from the ordinary 110-volt circuit and has four heat steps. It is said to be capable of many light repair jobs on the farm and in small shops. The "dual-purpose" holder doubles as an electrode holder and ground cable for metal-arc welding or as an arc torch with copper-coated carbons for brazing, soldering or welding non-ferrous metals. The welder is housed in a 15 by 8 by 12 ¾ in. carrying case that weighs 38 lbs when fully equipped. The complete outfit includes: (1) 110-volt a-c welding machine, 30–80 amp, (2) helmet and lens, (3) 6 feet of power cable, (4) combination electrode holder and arc torch, (5) 6 feet of ground and welding cable, (6) a supply of coated electrodes, brass rods and flux, (7) set of operating instructions. ERGOLYTE MFG. CO., Philadelphia.

★ ★



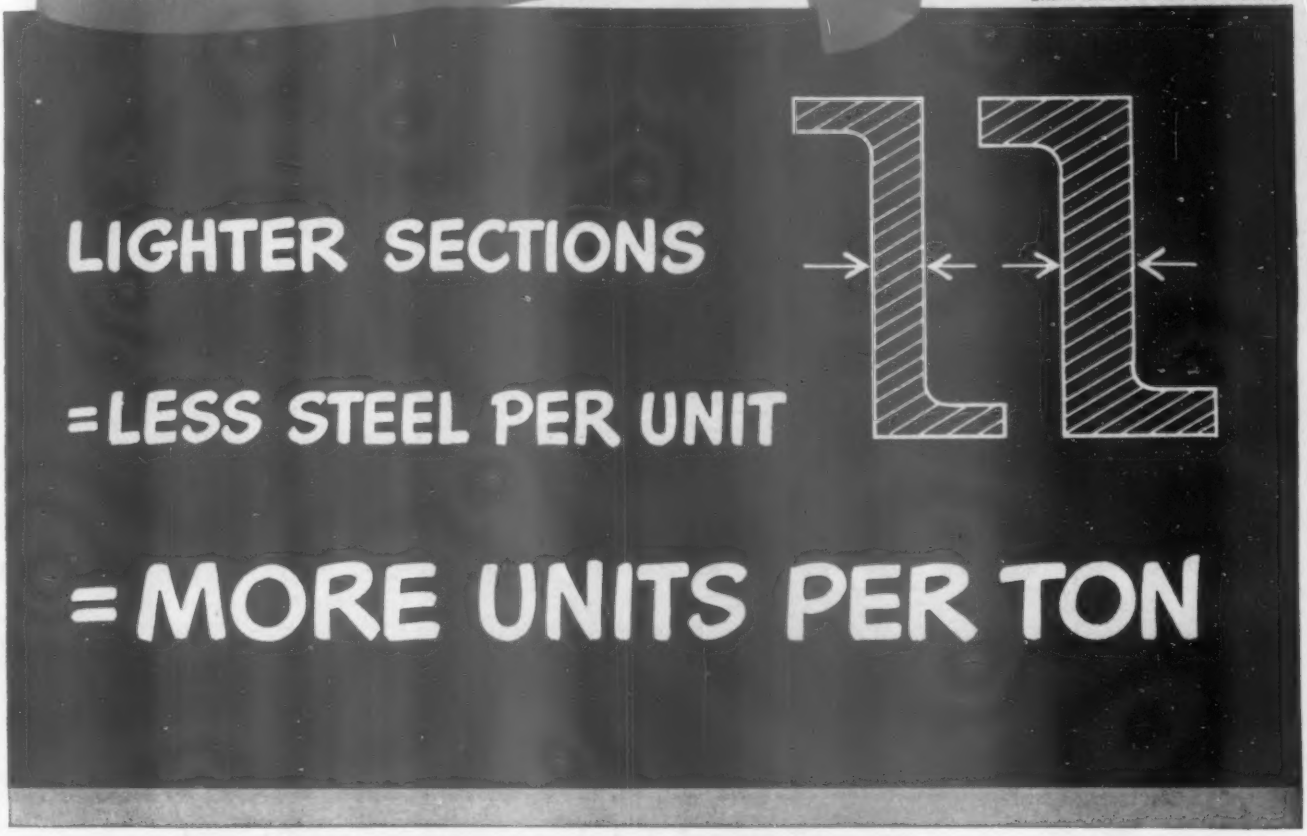
Pourous structure gives the "V-Eight" wheel a cool cutting action

Grinding Wheel

41 SIMILAR in structure to the conventional porous grinding wheel, the new "V-Eight" is said to hold its corners under extremely heavy cuts. Users report good results on such materials as steel of 60 Rockwell C hardness, soft tool steel, oil-hardened tool steel and high chromium die steel. AMERICAN EMERY WHEEL WORKS, Providence, R. I.

THE NEW ARITHMETIC IN STEEL

COPYRIGHT 1946
GREAT LAKES STEEL CORPORATION



THIS NEW ARITHMETIC SHOWS USERS OF HOT AND COLD ROLLED SHEETS HOW TO INCREASE PRODUCTION OF UNITS 33% WITH THE SAME AMOUNT OF STEEL

Here's a proved and practical answer to the problem of increasing production.

Make lighter sections of N-A-X HIGH-TENSILE steel. Use less steel per unit, get more units per ton. This low-alloy steel is so superior in tensile strength to carbon sheet steel that three tons will ordinarily do the work of four. Yet, with all its strength, N-A-X HIGH-TENSILE can be formed and drawn to intricate shapes because of its exceptional ductility.

You'll find other important advantages in N-A-X HIGH-TENSILE steel—excellent weldability, high fatigue- and corrosion-resistance, great impact toughness. This means a better and more durable product . . . and simpler and less costly fabricating, finishing and handling operations.

Until our metallurgists and engineers know more about your particular products and production methods, we can't tell you exactly how much N-A-X will help you. We're ready to investigate at your request.

MAKE A TON OF SHEET STEEL GO FARTHER
Specify—
N·A·X
HIGH-TENSILE STEEL

GREAT LAKES STEEL CORPORATION
N-A-X ALLOY DIVISION • DETROIT 18, MICHIGAN
UNIT OF NATIONAL STEEL CORPORATION

4 FEATURE

TIME SAVING ★ LABOR SAVING

ALL THE WAY DOWN THE LINE

1 Thousands of twisted wires properly shaped provide extra-flexibility. Less tiring to handle.

2 Tough construction offers greater resistance to abrasion, oil and water. Less time out for repair.

3 Bright copper wires of hair width sizes provide high conductivity. Steadier power on the job.

4 Heavy live rubber jacket and tape wrapping protect wires. Prevents "shorts" and breakdowns.

BURDOX

EXTRA-FLEX welding cable

"4 FEATURE" Extra-Flex Cable gives you more welds . . . better welds per man-hour because it works *with* the man-on-the-job. With its many exclusive production advantages, it costs you far less than you would expect to pay for cable of this high quality. Next time you order cable specify "Extra-Flex"!

Send for new free 64-page catalog of latest type welding and cutting equipment.

Immediately available in sizes from 6 to 4/0 from all welding supply distributors.

THE BURDETT OXYGEN CO.

3302 Lakeside Ave., Cleveland 14, Ohio

Welding & Cutting Equipment & Supplies
Industrial Safety Equipment

The Burdett Oxygen Co.
3302 Lakeside Ave., Cleveland, O.

☐ Please send copy of free 64-page catalog.

Name .....

Company .....

Address .....

City & State .....

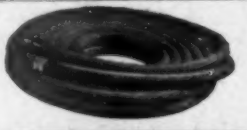
USE THIS ONE SOURCE OF SUPPLY

Save time, money, save shipping costs by ordering all your welding and cutting needs from one source—BURDOX—known for quality since 1920

WELDING EQUIPMENT

CUTTING EQUIPMENT

PROTECTIVE EQUIPMENT



Flash Welder

42 A NEW, battery-powered, stored-energy flash welder developed for the flash welding of aluminum is said to be capable of handling even fairly heavy

Progressive Welder's new flash welder

sections. This RWMA size 3, cam-operated machine is equipped with a 16-cell, 8-volt, water-cooled battery power pack, battery charger and charger assembly. The power pack supplies up to 38,000 amp and permits the machine to be installed wherever the power supply is adequate to operate a 10 or 15-hp, 3-phase motor. The combined use of a variable drive, cone-drive gear speed reducer and air-clutch brake takes care of the high acceleration, high upset forces and high deceleration required. (When flash welding aluminum, speeds are about 5 to 20 times as great as for steel.) PROGRESSIVE WELDER CO., Detroit 12.

* * *

Hard-facing Kit

43 THIS kit provides 10½ lb of electrodes in four types of alloys. These various hard-facing rods are individually packaged and marked as to uses and sizes. Contents of the kit include 2 lb of ⅛-in. "Trakaloy," 1 lb 5/32-in. type C, 1 lb ⅛-in. type A, 1 lb 5/32-in. type and 1 lb 5/32-in. "Flexaloy." A "bonus" of ½ lb 3/32-in. type C electrodes and a ten-page farm instruction handbook are also included.

Type C (green tip) is a rod that can be forged, drawn to sharp edges or heat-treated. It is used for hard-facing plow shares, mower shoes, scraper knives and similar farm equipment.

Type A (silver tip) can also be forged or heat-treated and offers resistance to impact and abrasion. It is used for repairing farm implements such as plows, mower shoes, can cutters, corn-planter runners, rotating hoes, thresher cylinder teeth, etc. "Trakaloy" (blue tip) is used for rebuilding worn cast iron and steel parts such as sprockets, gears, clutch dogs, hubs, tractor drive sprockets, track rails, guide wheels, etc. INDUSTRIAL OVERLAY METALS, INC., Chicago.

FACTS WORTH NOTING

RUFLUX P

USED IN WELDING ROD FORMULATION

RUFLUX P is particularly desirable in welding rod formulation as an arc stabilizer. It contains no injurious impurities. Its chemical analysis shows approximately 73% TiO_2, 19% K_2O with the balance moisture, ignition loss, and oxides of zirconium, silicon, aluminum, iron, calcium, etc. It is milled to 5% on a 200 mesh screen.

TAM

TITANIUM ALLOY MANUFACTURING COMPANY

Executive Offices: 111 Broadway, New York City *General Offices and Works:* Niagara Falls, N. Y.

miller

WELDERS *for*

SPEED—*as much as 35% faster—no magnetic arc blow.*

ECONOMY

—reduce power costs up to 50% below comparable D.C. equipment.

SATISFACTION

—"run a bead" with the Miller and you will know true welding pleasure.

"Sold only through recognized distributors"

MILLER ELECTRIC MANUFACTURING CO.
APPLETON, WISCONSIN

Cellulose acetate face shield provides protection for babbitting and similar tasks

Faceshield

44 DESIGNED to give overall protection on such jobs as babbitting, handling chemicals, etc. is a new faceshield made from a 0.040-in. sheet of cellulose acetate. The large window (18¾ by 10 in.) extends completely around the face and even covers the ears. A fibre head guard protects the upper forehead and top of the head. Adjustments are made by a metal knob, and friction joints hold the window securely in "on guard" or "off" positions. AMERICAN OPTICAL CO., Southbridge, Mass.

* *

Electrode for Stainless

45 "EUTECTRODE" is a new flux-coated electrode that permits a-c/d-c "low-temperature welding" on stainless steel. The weld deposits are said to have characteristics equal to or better than the stainless-steel base metal, including high resistance to corrosion and oxidation. The application at lower temperature minimizes the ill-effects of welding heat on the corrosion resistance and physical properties of the base metal, states manufacturer.

These electrodes are available in diameters of from $\frac{3}{64}$ to $\frac{3}{16}$ in. and in three grades of stainless: $\frac{1}{8}$ for stainless types 301, 302, 303, 304, 308, 321 and 347; $\frac{5}{32}$ for type 309 and stainless-clad steels and $\frac{5}{20}$ for type 310 stainless and high-strength, low-alloy steels. EUTECTIC WELDING ALLOYS CORP., New York City 13.

* *

Cement for Grinder Discs

46 "MASTER DISC CEMENT" may be used for applying cloth-backed or flexible paper discs to steel-based grinding wheels. This cement is said to hold the abrasive disc tightly to the steel face and yet allow worn discs to be removed in a short time. The material is available in quart cans only. THE KINDT-COLLINS CO., Cleveland 11.

TWO REVOLUTIONARY NEW PRODUCTS by

WOW

Made by WELDORS for WELDORS

•

No. 700 ROD

For WELDING

- ***DIE CAST WHITE METAL***
- ***SHEET and CAST ALUMINUM***

•

No. 1 FLUX

For WELDING and BRAZING CAST IRON

THERE is nothing comparable to the No. 700 rod for ease and scope of application. No flux required, no precleaning of the metal, no porosity in the deposit.

No. 1 flux works perfectly with either bronze or cast iron filler rods. Unbeatable for silver brazing stainless steel. No precleaning—does not leave a hard, glossy scale.

Nothing Finer Available

Try them and you'll like them

WRITE US TODAY

WOW
WELDING SPECIALTIES CO.
149 S. WESTERN AVE.
Chicago 12, Ill.

IF YOU ARE WELDING

STAINLESS STEEL OR ALUMINUM

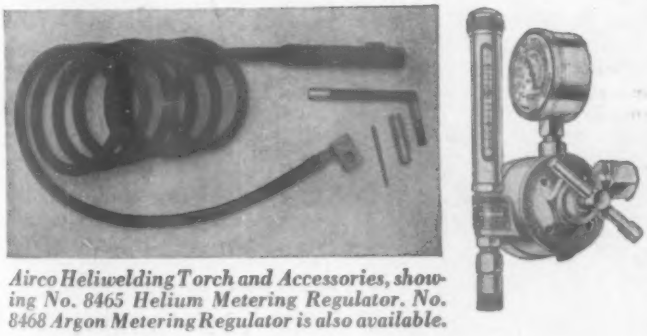
AND WANT . . .

- *A smooth deposit, with strict uniformity of weld in all positions*
- *No added structural weight in your finished product*
- *Maximum tensile strength and ductility*
- *A minimum of carbide precipitation . . . maintenance of corrosion-resisting properties when welding stainless steel*

USE Airco Heliwelding

This arc-welding process, in which an atmosphere of helium envelops a single tungsten electrode, prevents oxidation. It brings a new efficiency and economy to the welding of light gauge metals. The ease of application, and high dependability has proved superior to other welding methods for aluminum, stainless steel and magnesium.

Airco Folder ADG-2019 gives you valuable information about this exceptional process. Fill in and mail the coupon for your copy. Air Reduction, General Offices, 60 East 42nd Street, New York 17, N. Y. In Texas: Magnolia Airco Gas Products Company, General Offices, Houston 1, Texas. Represented Internationally by Airco Export Corporation.



Airco Heliwelding Torch and Accessories, showing No. 8465 Helium Metering Regulator. No. 8468 Argon Metering Regulator is also available.

AIRCO

AIR REDUCTION

Offices in All Principal Cities

Headquarters for Oxygen, Acetylene and Other Gases . . . Carbide . . . Gas Welding & Cutting Apparatus and Supplies . . . Arc Welders, Electrodes and Accessories

WE

AIR REDUCTION
60 East 42nd Street
New York 17, N. Y.

Please send me a copy of Airco's Folder on Heliwelding—No. ADG-2019

Name_____

Firm_____

Address_____

City_____ Zone_____ State_____

GREYHOUND FARM WELDERS

Can be used on any Farm that has suitable Power lines. The Greyhound Farm Welder conforms to NEMA standards and EEI and REA requirements.

Built-in Power Factor Correction, ideal for Rural Power Lines.

SAFE—frame and housing of welded steel—electrically grounded metal case.

Continnous current control, quick adjustment by simply turning a Hand Wheel providing infinite number of current settings.

Portable—easily moved about.

Economical to operate.

Greyhound Welders sold exclusively thru Distributors in the U.S. and foreign countries.

GREYHOUND A. C. ARC WELDER CORP.

604-606 Johnson Ave., Brooklyn 6, N. Y.

Save Material!

(MEND THE HOLE IN THE BOTTOM AND YE CAN COOK IN THE WHOLE KETTLE)

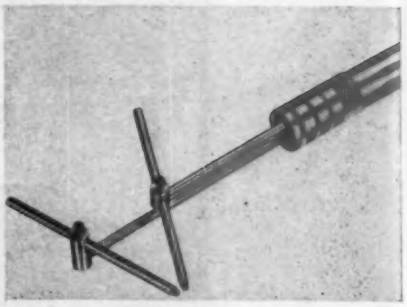
with

YORK'S 77 CAST IRON BRAZING FLUX

1. Fear of overheating can be forgotten.
2. Cleaning and grinding are unnecessary, because "York's 77" penetrates through grease, oxides, etc.
3. Chipping is unnecessary, because a satisfactory bond can be obtained on oxidized surfaces.
4. Deteriorated cast iron can always be welded successfully with "York's 77."

YORK ENGINEERING COMPANY

3349 OGDEN AVE. • CHICAGO 23, ILL.



"Lite-ning" carbon-arc torch welds or brazes ferrous and non-ferrous metals including aluminum

Carbon-Arc Torch

47 "LITE-NING" is the name of a new carbon-arc torch for use with both a-c and d-c welders. This torch produces a soft, intense heat without pressure blow and is said to make possible the successful arc welding of thin-gauge aluminum sheets. Practically all ferrous and non-ferrous metals may be welded with this torch, which is also useful for brazing, soldering, preheating and hard-facing applications. A thumb control enables the operator to maintain adjustment of the arc at all times. This unit is available in two models: one for ¼-in. and one for ⅜-in. carbons. CESCO PRODUCTS, INC., Chicago.

* *

Stainless Electrodes

48 A NEW line of stainless-steel electrodes are available in a full range of grades and diameters with two types of coatings. One is for either a-c or d-c use, and the other for-reverse polarity d-c operation. Both types can be used in all welding positions. Arc stability and deposition characteristics assure flat fillet welds and good directional control, states manufacturer. These electrodes are furnished in 1/16, 5/64, 3/32-in., 1/8, 5/32, 3/16 and ¼-in. sizes. GENERAL ELECTRIC CO., ELECTRIC WELDING DIVISION, Schenectady, N.Y.

* *

Recirculating Pump

49 A NEW recirculating pump may be used for circulating coolants to spot welders, lathes and other machine tools. Driven by a 1/60-hp motor, the pump has a water output of 2 gpm at 72-in. head. The entire unit is 10 in. high, and the water outlet is of ¼-in. diameter. This pump is supplied on rubber vacuum feet for vibration dampening and for operation at either 110 or 220-volts, 50–60 cycles. Dan Morey Mfg. Co., Department WE-1, Los Angeles 35.

* *

Automatic Electrode

50 "Raco composite type A," a new automatic arc-welding electrode consists of a grooved electrode wrapped with six spiralling wires and coated with flux. This structure eliminates the need of slitting shielded-arc coatings in order to obtain contact. THE REID-AVERY Co., Baltimore.

Los Angeles Times 9 A.M. FINAL

1280-Mile Gas Line Authorized

Project Will Cost $70,000,000 to Bring Texas Fuel Here

A 1280-mile, $70,000,000 pipe line to bring natural gas here from Texas and New Mexico has been authorized by the Federal Power Commission, officials of two gas companies in Los Angeles were informed yesterday.

The pipe-line facilities are designed to meet a developing shortage in the local natural gas supply for 3,500,000 persons in California. F.P.C.

Berkeley Continuous

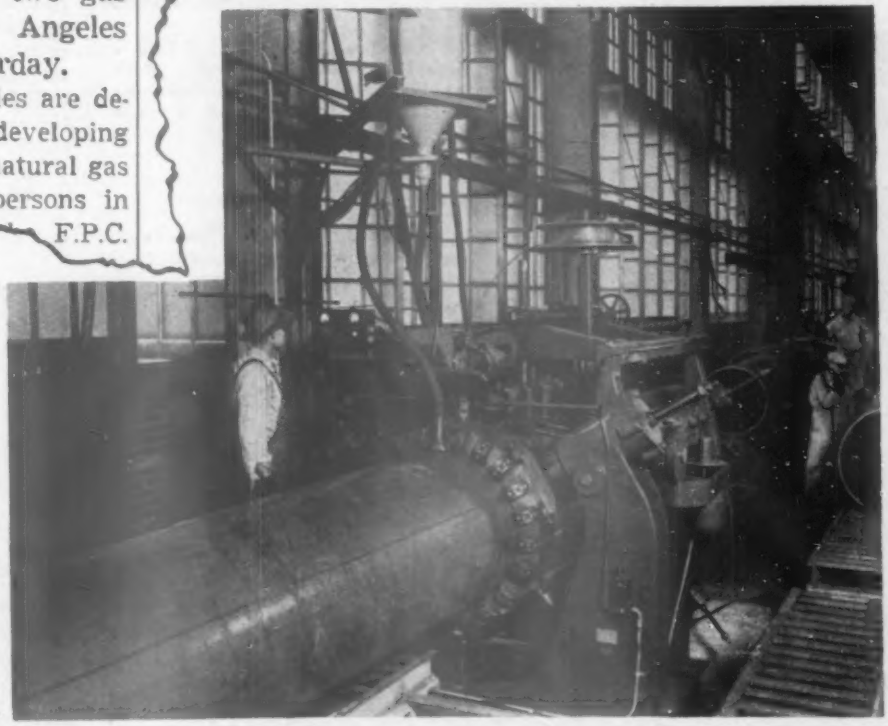
Longitudinal Seam Welders

will weld the seams of the largest diameter pipe line ever authorized

It's a big job to we'd the seams of 30″ fabricated pipe. It must be done economically and the machines for doing it must be dependable—that's why the Consolidated Steel Corp. selected the 3C Berkeley for this important work. They know it will deliver uniform, high quality welds, continuously day after day.

There's a size "Berkeley" to weld preformed tubes 5″ to 36″ in diameter.

Write us, we will suggest the best type for your requirements.



Illustrated is a Type 3C "Berkeley" in operation. Machines like this will be used for welding the pipe for this big undertaking.

PENN TOOL & MACHINE CO.

DANVILLE, ILLINOIS

On the Job

Welded Magnesium Ladders

LIGHTWEIGHT magnesium ladders that last a lifetime are now being manufactured by White Aircraft Corp., Palmer, Mass. The rungs are welded into the side channels on a production basis by means of the inert-gas-shielded arc process. The all-welded construction assures rigidity and a complete freedom from the loosened joints which make a wooden ladder wobbly.

The lesser weight of these magnesium ladders is astonishing. An 8-ft ladder weighs only 5½ lb as compared to 16 lb in wood, while the weight of a 24-ft extension ladder has been cut from 63 to 31 lb. Even a woman can easily handle the magnesium extension ladder, as the picture shows. An additional advantage is that the ladder's strength is permanent, for its all-metal construction avoids the splintering and deterioration to which weather exposure subjects wood ladders.

Courtesy The Dow Chemical Co.

Of all-welded construction, this 24-ft magnesium ladder weighs only 31 lb, can be picked up and carried by a woman

This workman is not looking into a mirror but at his fellow operator. Both men must raise both hands and press two starting buttons to start this new multiple spot welder

Spot Welder Safety Guard

SAFETY considerations were paramount in the design of this new automatic multiple spot welder installed to weld the metal door frames of Fruehauf trailers. To start the machine, each of the two operators must raise his hands and press two buttons simultaneously. This precaution renders it absolutely impossible for either man to have one of his hands caught in the machine.

* *

Not a Spike in a Spur

STEEL plate originally intended for ships became railroad ties when Kaiser's Shipyard Three, Richmond, Calif., decided to run a spur track down to an asphalt dock. Having plenty of scrap plate handy, the management found it logical to flame-cut the steel railroad ties and use the welding torch to supplant the sledge hammer. There isn't a single spike in this spur.

The rails were clipped to the ties and to intermediate pads which absorb part of the weight to prevent locomotives and cars from sinking into the pavement across which the track is laid. The crossing was built up to track level. One of the advantages of this welded railroad track is that it can be removed easily.

Welded clips and pads hold the steel ties to the rails in this shipyard rail line

* *

Tank Welded Automatically

AN AUTOMATIC-WELDING process was successfully employed at General Iron Works, Denver, to do the circumferential welding on a 5-ft-diameter pressure vessel built for Stearns Roger Manufacturing Co. As the picture shows, the tank was rotated while the welding head remained stationary. The nozzle arrangement appearing beneath the big cylinder is used to preheat both sides of the weld with natural gas to a maintained temperature of 350 F.

Each of the sections thus joined is 10 ft long and formed of plate 2½ in. thick. The completed tank measures 70 ft long and weighs 56 tons.

Courtesy General Electric Co.

This 5-ft pressure vessel was formed of 2½-in. plate. The sections were joined circumferentially by automatic welding

Welding a Cast-Iron Bell

By William Schmitz
Schmitz Welding Shop, Canyon, Tex.

RECENTLY I was faced with the unusual task of repairing a crack in a large cast-iron bell. All the information I was able to secure on how to do this job proved to be very meager, so I decided to exercise my own judgment.

The bell was of quite good size—36 in.

Welding made this cracked bell as good as new, with its tone little, if any, affected

in diameter by 34 in. high by 2 in. thick. It weighed about 500 lb, and the crack was 23 in. long. The base metal must have been chilled, for when I tried to vee the crack with a chisel the metal seemed to be harder than the chisel. I was thus forced to turn to my cutting torch.

I cut a double vee—both inside and out—so as to leave about ¼ in. of base metal in the bottom of the groove to preserve the alignment. Then I preheated the bell with a natural gas flame to about 400 F. For welding, I used an a-c welder set at 125 amp and ⅛-in electrodes of high-nickel content, About 5½ lb of electrodes were consumed.

I began on the inner surface of the bell and at the extreme inside of the crack. When I had laid a bead of about 2 in. long, I allowed it to cool to the bell temperature, maintained at around 400 F by the preheating flame. Then I turned the bell over and welded the same distance on the outer surface as I had welded inside. This bead was also allowed to cool, and I turned the bell over once more and welded another 2-in. section from the inside. I continued in this manner until I had reached the extreme inner edge.

The accompanying picture plainly shows the location of the crack as well as the method I used to suspend the bell for welding. I had a report on the job a short time ago and learned that the tone of the bell was little, if any, affected by the welded repair.

PRODUCTION UP- COSTS DOWN

PROFIT POSSIBILITIES in any job shop or on any production line depend on higher output at lower cost.

G-R offers this "ideal combination" with:

● **FASTER WELDING** . . . because magnetic blow is eliminated with G-R's smooth a. c. arc current. Thus you can use higher heat with faster burn-off, which means higher rate of deposit . . . *more welding done every hour!*

● **LOWER COSTS** . . . because up to 94.6% of the power consumed is available as usable welding current with a G-R . . . nearly twice the efficiency of d. c. motor generator sets!

Step up production with A. C. welding . . . and for A. C. at its best, specify **G-R!**

G-R Model 35, with a welding range of 15 to 330 amperes, heads the G-R line of five "General Purpose" welder models, starting with the 10-100 ampere Model 10C. All are available with built-in power factor correction.

The 10- to 675-ampere Model 49 is one of four G-R Heavy Duty Industrial Models for manual operation. G-R also builds heavy-duty models for automatic-head welding, to 2,500 amperes.

GLENN-ROBERTS COMPANY

2107 ADAMS STREET • INDIANAPOLIS 1, INDIANA
3100 E. TENTH STREET • OAKLAND 1, CALIFORNIA

News of the Industry

New Gas Firm Opened in Chicago Area

CHARLES W. STEELE, associated with the compressed gas industry since 1918 and Chicago district sales manager for National Cylinder Gas Co., has formed his own gas manufacturing firm, Steele Gases, Inc. This Illinois corporation has offices and plants in Chicago and South Elgin, respectively. The Chicago sales offices is located at 127 N. Dearborn St.

Established for the production and distribution of oxygen, hydrogen, acetylene, nitrogen and other compressed gases, the new firm will serve the entire metropolitan Chicago area, including all towns within a radius of two hundred miles.

Mr. Steele has taken active interest in the welding and cutting field for many years, devoting much time and effort to the development and dissemination of new ideas to many organizations. He is second vice-chairman of the Chicago section of the American Welding Society.

* *

Draw up Standards for Use of Light-Gauge Steel

THE American Iron and Steel Institute has disclosed official industry standards for light-gauge steel which will make possible broader uses of the material in certain types of building construction. This comprehensive "Specification for the Design of Light-Gauge Steel Structural Members" is the result of studies begun in 1939 under the Building Code Committee of the Institute. This work has been carried on continuously at Cornell University under the direction of Dean S. C. Hollister of the college of Engineering, Professor W. L. Malcolm, director of the school of civil engineering, and Dr. George Winter, associate professor of civil engineering.

The program has had as its objective, a study of the behavior of light-steel structural members under load and the proper portioning of such members. Included was a study of available engineering literature on the subject, supplemented by tests on beams, studs or light columns and panel or deck constructions involving nearly 700 structural specimens.

The specification consists of design provisions governing shapes made up of flat or straight elements most commonly encountered in the design of structural members found of light-gauge steel. It has four appendices which deal with problems of application. These contain: illustrative sketches, design charts, design examples and explanatory material related to the evaluation of the lateral bracing value of wall materials. Other features include material qualifications, design procedure for stiffened and unstiffened compression elements, box-type, U-type and multiple-stiffened elements, also minimum properties for edge stiffeners and maximum allowable ratios of width to thickness.

Also covered is a procedure for determining the adequacy of the lateral support provided by the sheathing of finishing materials attached to studs in load-bearing walls and partitions, amount of lateral restraint required, evaluation of the applied materials and their attachments with respect to such lateral support.

* *

Weldit Moves to New Plant

WELDIT INC., manufacturer of welding equipment and supplies, is now located in its new office, manufacturing plant and warehouse at 990 Oakman Blvd., Detroit 6. The new plant occupies some 10,000 sq ft of floor space and is equipped with improved facilities, including new automatic machinery and a repair department for the repair of all types of welding and cutting equipment.

* *

Technical Editors View 20,000,000-Volt Betatron

MORE than 60 editors of newspapers, technical magazines and professional journals from all parts of the country recently viewed the first demonstration of the 20,000,000-volt betatron at the Picatinny Arsenal, Dover, N. J. This machine, manufactured by the Allis-Chalmers Mfg. Co., Milwaukee, is said to be capable of penetrating 20 in. of steel in 20 minutes and to detect flaws of almost microscopic dimensions.

The unit, which is housed in a special X-ray laboratory at the Arsenal, may be considered as a two-winding transformer with a stream of electrons to take the place of the secondary winding. The secondary high voltage winding, instead of being made up of the hundreds of thousands of turns of very small wire which would be necessary to produce 20 million volts, is replaced by a doughnut-shaped vacuum tube. Projecting into the tube is a sturdy filament and a tiny platinum target. The electrons are accelerated by magnetic flux in a circular orbit until their velocity nearly approaches the speed of light. At the peak of their speed, the electrons spiral off and collide with the tip of the target, creating a rich supply of high-frequency X-rays. Advantages of the betatron are said to be the greatly increased speed and detail with which X-rays can be made. Little information, however, has as yet been revealed on its applications, if any, to weld inspection.

* *

Use Electrons to Study Atomic Structure of Metal

USING a stream of electrons to study the atomic structure of metals and gases to identify invisible layers of films of foreign materials on metal surfaces has been developed into a practical process in University of Michigan chemistry laboratories. The "electron diffraction" method of analyzing metal surfaces finds practical use in welding and other fields.

An early wartime use of electric diffraction was found at Willow Run bomber plant, where it was necessary to weld large aluminum sheets. Before aluminum can be welded, it must be cleaned, as aluminum oxide forms quickly on any exposed surface of the metal. An electron diffraction study of this oxide revealed its atomic structure and also indicated the efficiency of various methods of cleaning the metal before welding.

* *

WAA to Sell Two Electrode Plants

Two California war plants—one near Pittsburg, the other in Stockton—used for the production of coated welding electrodes for the Navy are being offered for sale or lease by the War Assets Administration. The Pittsburgh plant, formerly operated by Arcrods, Inc., was designed to produce 4,000,000 lb of welding rods monthly and represents a cost of $837,000. The Stockton plant, formerly operated by the National Cylinder Gas Co., was designed to produce 1,750,000 lb of welding rods monthly and represents a cost of $170,000 to the government.

Written proposals must be received at the WAA Regional Office, 1182 Market St., San Francisco 2, Calif., before 10 A.M. (PST), Jan. 7. for the facilities at Stockton (Nobs-663 Navy) and before 10 A.M. (PST), Jan. 31, for the facilities at Pittsburg (NObs-172). Specific information on the properties may be obtained from the WAA San Francisco regional office.

* *

Arcos Opens New Welding Laboratory

A NEW laboratory building has been built by Arcos Corp., Philadelphia to house its research and engineering department. The addition will permit the department to expand its research and quality control activities. The new building is located at 50th & Paschall Ave., adjoining the present Arcos plant at 401 North Broad St., Philadelphia 43.

Officers Unchanged at Recent IAA Meeting

ONE-HUNDRED and four members were present or represented by proxy at the annual meeting of the International Acetylene Association, held November 15 in New York City. They voted that all officers and directors be continued without change until the 1947 annual meeting. Officers who thus remain in office are: Glenn O. Carter, The Linde Air Products Co., president; R. B. Swope, Southern Oxygen Co., Inc., vice-president; H. F. Reinhard, secretary, and Philip Kearny, treasurer.

During the subsequent meeting of the IAA board of directors, held on the same day, it was pointed out that there exists no basic visual-aid training unit in motion or slide film that adequately presents to the students the processes, applications and possibilities of oxy-acetylene welding, although there are several such films, some of them quite new, on the electric welding processes. A thirty-minute sound film was estimated to cost in the neighborhood of $40,000. The program, publicity and arrangements committee was requested to look into the matter and to report to the board of directors. The Committee was authorized to spend up to $5,000 in making a study of the story the industry has and should tell.

The board of directors voted changes in the executive committee, personnel of which now consists of Messrs. Henry Booth, chairman, Philip Kearny, J. J. Lincoln, Jr., and C. E. Monlux.

The board of directors also voted that a committee be appointed to determine what kind of a 1947 meeting would best serve the interests of the members. The recommendations of this committee will be submitted to the board at a luncheon meeting on Wednesday, January 29, 1947, the day following the annual meeting of the Compressed Gas Manufacturers' Association.

* *

To Publish Wartime Advances in Metallurgy

ADVANCES in ferrous metallurgy made during the war will be recorded in a series of books to be published by the Alloys of Iron Research, a project of the Engineering Foundation, New York City. The first volume will contain a description of the characteristics and properties of the many new alloy steels developed during the war, and a summary of new principles of plastic deformations at elevated temperatures which have proved of value in developing new steels for high and low temperature use. This volume, being prepared under the direction of Frank T. Sisco, will also contain a broad summary of the present status of ferrous metallurgy.

The succeeding books will be broad discussions of available published and unpublished information on individual series of new steels and on older steels that have been greatly improved in properties in the last few years, either by the use of new alloying elements or by the use of new principles of mechanical and thermal treatment.

Announcing

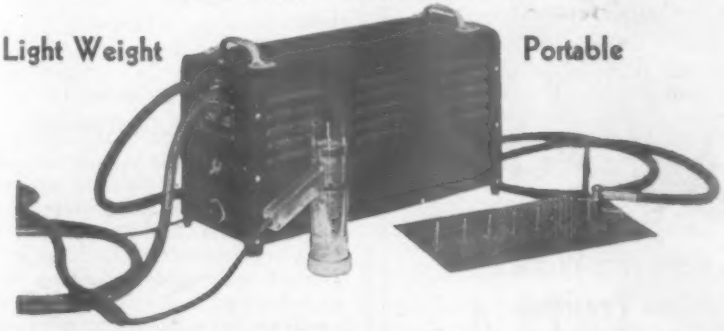
THE GRAHAM STUD WELDING GUN

especially designed for

STUD WELDING ALUMINUM

from 1/16" to 3/4" diameter

Light Weight Portable



Makes uniform welds simply and instantaneously without the use of timing devices or contactors. Operation is economical and foolproof. The operator needs no skill or training. Welds are clean, smooth and made without distortion or heating of metal. There are practically no craters or fillets and no flux is necessary.

No Generator is required

Mfd. by Boston Cutting Die Co., Boston, Mass.

For further information write to

C. H. STEVENS & COMPANY

15 ANN ST. *Sales Agents* SOUTH NORWALK, CONN.

Pacific Carbide is generating acetylene in 12 countries

A tested carbide . . meeting International and Federal specifications . . generating acetylene in 12 countries. Standard sizes in 100-lb. and 500-lb. drums. Location of our plant at Portland, Oregon permits low-cost delivery to all deep-water ports. Address:

Pacific Carbide & Alloys Co.
(Subsidiary of Stuart Oxygen Co.)

351 California Street
SAN FRANCISCO 4

IMPORTANT: These companies are not connected with any other producers of Carbide.

Your WELDING JOBS Are Done

FASTER EASIER BETTER

when you use...

Mid-States METAL ZIPPER

Do your welding jobs faster, easier, better and make more money... with Mid-States Metal ZIPPER, world's finest arc welder! Packed with exclusive features! Extremely easy to operate! Outperforms anything in the welding field, yet costs no more. Get the most for your welder dollar ... get a Metal ZIPPER!

See your jobber or write for complete details, now!

Mid-States EQUIPMENT CORP.

2429 SOUTH MICHIGAN AVENUE, CHICAGO 16, ILLINOIS

KLING Rotary Shear

DOES THE WORK OF 4 MACHINES

A VERSATILE SHEAR

for Versatile Work with Hairline Precision

The Kling Rotary Shear embodies the latest developments in sheet and plate cutting especially recommended for:

- Air conditioning
- Appliances
- Automotive
- Aviation
- Boiler Shops
- Heating & Ventilating
- Letter Cutting
- Maintenance
- Metal Specialties
- Petroleum
- Railroads
- Shipbuilding
- Steel Warehouses
- Tanks

Send Today for Free Bulletin 245

KLING BROS. *Engineering Works*

PUNCHES; BAR & ANGLE SHEARS, COMBINATION SHEAR, PUNCH & COPERS; BENDING ROLLS, HIGH SPEED FRICTION SAWS & GRINDERS

1319WE N. KOSTNER AVE., CHICAGO 51, ILL., U.S.A.

Ryerson Builds New Office Building

DESIGNED and engineered to provide working space that will assure maximum speed and efficiency in handling and dispatching orders, a new two-story office building has been completed at the Pittsburgh plant of Joseph T. Ryerson & Son, Inc., steel jobbers. This building is a steel, brick and stone structure of conventional design. Its location with respect to plant operations, coupled with the engineered arrangement of the general offices, is such that order flow is streamlined to a degree that permits fast handling with little lost motion, the company asserts.

* *

Compressed Gas Ass'n Meets January 27–28, New York

THE 34th annual meeting of the Compressed Gas Manufacturers Association, Inc. will be held at the Waldorf-Astoria Hotel, New York City, January 27 and 28. The first day of the meeting will be devoted to committee meetings, a luncheon, an open meeting for discussion of the revisions committee, work on the revision of the ICC regulations and specifications and the annual business meeting. A technical session will be held on the second day, and all members are urged to submit subjects for discussion.

* *

Allegheny Ludlum Opens New Warehouse Facilities

EQUIPPED with the latest facilities for stocking tool steels and designed to serve southwest Ohio and Kentucky, a new warehouse has just been opened at 1270 McCracken Ave., Dayton, O., by the Allegheny Ludlum Steel Corp. It will serve to close the gap between the company's tool-steel mill at Dunkirk, N. Y., and its customers in Cincinnati, Louisville, Columbus, Frankfort, Newport, Covington and other cities in the two-state area.

* *

Use Argon to Eliminate Porosity in Molten Steel

A FLUSHING process by which dry nitrogen or argon is bubbled through molten steel is said to eliminate the dissolved hydrogen that would otherwise cause pockets of porosity. It is anticipated that this process, developed by Air Reduction Sales Co., will find wide use in foundries to minimize casting rejects caused by porosity.

* *

New Firm Enters Welding Field

Two ex-servicemen, Jack Scott and William G. Browne, have formed their own welding firm, The Scott Browne Corp., on Batavia Pike, Newton, O. The company will start constructing its plant as soon as the charter is approved by the Secretary of State.

G-E Buys Steel Co.

In order to meet the need of consumer products made from hot-rolled sheets, General Electric Co. has purchased the 30-year old Mahoning Valley Steel Co., of Niles, O. John P. Hosack, who has been vice-president and treasurer of the steel company, has been named president and treasurer of the new G-E. affiliate. Other officers who will continue in the same capacity are George L. Wick, secretary, and Thomas C. Clingan, assistant treasurer.

* *

Organize Welding Firm in Seattle, Wash.

Robert S. Reynolds, Charles E. Harvey, James R. Dickson and James Brown recently organized their own welding firm, The Northwestern Welding Co., in Seattle, Wash.

* *

New Distributors

All-State Welding Alloys Co., Inc., White Plains, N. Y.: (distributors of welding and brazing alloys and fluxes) Harris Sales Co., Lansdowne Pa.; P. S. McCracken & Sons, Philadelphia; Valley Welding Supply Co., Salem, Oregon; Key Equipment Co., Oakland, Calif.; Moore's Welding Supply Co., Sacramento, Calif.; Davis Industrial Products Co., Portland, Oregon.

About People

S. S. Callner has been appointed midwest regional sales manager for All-State Welding Alloys Co., Inc., White Plains, N.Y. He will handle the company's line of welding and brazing alloys and fluxes for a territory comprising Illinois, Indiana, Wisconsin and the upper peninsula of Michigan. His office is located at 53 W. Jackson Blvd., Chicago. Mr. Callner graduated from the University of Illinois and has had many years of experience in metallurgical and sales engineering, involving heat-treating equipment, mechanical and electrical maintenance equipment and special welding alloys.

* *

Donald J. Will has been elected president of Stuart Oxygen Co., San Francisco. He succeeds Patrick Coyne, who assumes chairmanship of the board of directors. Mr. Will's election also makes him president of the company's subsidiaries, Standard Acetylene Co., Ltd., Oakland, Calif., Valley Oxygen Co., Hanford, Calif. and Pacific Carbide and Alloys Co., Portland, Ore.

Fuse-Well Cast Welding Rods

THE STANDARD OF QUALITY

Throughout the World

CAST ALUMINUM

WELDING RODS

OF STANDARD ANALYSIS

PLAIN AND ALLOYED GRAY IRON

WELDING RODS

AND ELECTRODES

THE CHICAGO HARDWARE FOUNDRY CO.

Dependable Since 1897

147 ENGINEERING BUILDING

NORTH CHICAGO, ILLINOIS

A-LUM-ITE

WELDS WHITE METAL

BRAZES ALUMINUM ALLOYS

Large Stock-No Priority-Prompt Delivery

A-LUM-ITE is the ideal gas rod for the welding of white metal (die cast) and the brazing of aluminum alloys.

Uniformity, high tensile strength, machinability and ease of application (without the use of flux) are the real reasons A-LUM-ITE is winning the confidence of welders everywhere.

A-LUM-ITE is available in standard sizes: 1/8", 5/32", 3/16", 1/4" and complete assortment. Full instructions are furnished with each pound. Write or phone for free literature and samples.

SOUTHERN OXYGEN CO., INC.

P. O. BOX 5087, WASHINGTON, D. C.

AGILE
WELDING ELECTRODES
give positive
PERFORMANCE

Here is a "streamline" of quality welding electrodes. We use the term because we have pared our rod types to a minimum number which covers the entire field of welding application. Thus, you can replace your electrode stock efficiently and without "muss or fuss."

AGILE
WELDING ACCESSORIES
give guaranteed
SATISFACTION

We place at your disposal a complete line of high grade welding accessories. Helmets, hand shields, lenses, gloves, cleaning tools, electrode holders and welding cable. We offer prompt quotations and delivery. Buy your welding requirements from a single source.

AGILE ACTARC

send for your
FREE CATALOG TODAY!

★

AMERICAN AGILE CORPORATION
5806 HOUGH AVENUE
CLEVELAND 3, OHIO

RICHARD C. GERDES has been appointed Chicago district supervisor of production planning for American Steel & Wire Co. J. W. HOOVER has been named general traffic manager for Carnegie-Illinois Steel Co., also representing National Tube Co., American Bridge Co., H. C. Frick Coke Co., United States Coal and Coke Co. and Pittsburgh Limestone Corp. CARL A. ILGENFRITZ has been elected vice-president of purchases for Carnegie-Illinois Steel. All of these companies are subsidiaries of the U.S. Steel Corp.

★ ★

W. B. WORDEN has been named central sales manager for R. G. Le Tourneau Inc., Peoria. He succeeds M. E. MILLER, who resigns to become sales manager for the Rozier-Ryan Co., LeTourneau distributor in St. Louis. Mr. Miller will be located in Peoria and will supervise activities of representatives in approximately 20 midwestern states. HAROLD F. STENSTROM has been appointed district sales representative for Missouri, Tennessee, Arkansas, Louisana and Mississippi. His headquarters will be in Memphis.

★ ★

C. W. RAMBO, who for a number of years operated the Quick Service Welding Company and Wilco Electric Welding Machine Co., in Kansas City, Kansas, has sold out these two businesses and moved to Tieton, Washington. In his new location, he is serving as northwestern representative and manufacturer's agent for various producers of welding equipment and supplies.

★ ★

Four division executives were recently elected vice-presidents of the American Brake Shoe Co. The new officers are: JOSEPH B. TERBELL, executive vice-president, American Manganese Steel division; JOHN S. HUTCHINS, president, Ramapo Ajax division; WILLIAM T. KELLY, JR., president, Engineered Castings division and the Kellog division, and THOMAS W. PETTUS, president, National Bearing division.

★ ★

Seven new welding sales engineers have been appointed by the Lincoln Electric Co. to aid in extending service to all users of electric arc welding. They are: MARVIN ANDERSON, Moline, Illinois office, ALBERT BAVARIS, Philadelphia office, RICHARD FREUNDLICH, Cleveland office, PAUL HOLDEN, Franklin, Pennsylvania, office, RICHARD NELSON, and JOHN B. WILLIAMS, Syracuse office and RICHARD K. REYNOLDS, Detroit office.

★ ★

DR. C. EARL WEBB has been appointed chief engineer, American Bridge Co. He succeeds Dr. Charles F. Goodrich, who who retires after 40 years service with this U.S. Steel subsidiary. Succeeding Dr. Webb as the company's western division engineer is ALBERT P. BOYSEN, who has been associated with American Bridge since 1912.

The Improved "Round File"
GAS LIGHTER
●
Locking
"Slip-on"
Renewal
...an exclusive feature

The patented cartridge holding the spark metal locks exactly in correct position, permitting instant replacement. Get acquainted with the many other superior, exclusive features of Improved Round File.

SAFETY GAS LIGHTER CO.
(Est. 1901)
LYNN, MASSACHUSETTS
●

W-AL-CO RODS
for Welding of ALUMINUM

ELECTRIC AND GAS WELDING

Drawn Wire
Types 2S, 43 and 52
Brazing 716 (low Melting)

FOR CAST ALUMINUM

Use Extruded Rods
Types 142, 195, 355 and 356
for Better Welding
3/16" size only

Welding Alloys Manufacturing Co.
744 Broad St., Newark 2, N. J.

JOHN G. FITZPATRICK has been appointed direct factory representative of Allied Steel Products, Inc., Indianapolis. Mr. Fitzpatrick will call upon company dealers in Ohio, Michigan, Indiana and Illinois. His headquarters will be at 208 Buckingham Drive, Indianapolis. The company produces special shapes in maintenance steels for welding.

* *

Recently elected vice-presidents of the Belden Mfg. Co. are H. H. WERMINE, chief engineer in charge of plant development and research engineering, and WALTER, A. RUDOLPHSEN, superintendent of the company's Richmond, Indiana, plant.

* *

HERBERT L. WHITTEMORE, mechanical engineer, National Bureau of Standards, has retired after 29 years of continuous Government service. Mr. Whittemore, an authority on the testing of engineering materials, has been chief of the engineering mechanics section since 1918.

* *

FREDERICK R. LACK, vice-president of Western Electric Co. and GEORGE H. TABER, JR., executive vice-president of the Sinclair Refining Co., have been named president and vice-president respectively of the American Standards Association for the coming year.

* *

HAROLD P. CURTIS, formerly Pacific Coast manager for Rustless Iron & Steel Corp., has been appointed sales manager of The Babcock & Wilcox Tube Co. in this same area. Mr. Curtis' headquarters are in the Banks-Huntley Building, 634 S. Spring Street, Los Angeles.

* *

THOMAS A. KNOWLTON, formerly director of the disputes division, New York Regional War Labor Board, has joined the labor and industrial relations counselling division of National Foreman's Institute, Inc., Deep River, Conn.

* *

ALBERT R. KNAUSS, formerly of the Allis-Chalmers Mfg. Company's Tulsa district office, has been named manager of the office at Memphis, Tenn. CHARLES F. CODDINGTON has been promoted sales manager of the company's blower and compressor department in Milwaukee.

* *

DANIEL ROSENTHAL, formerly with the research section of the American Welding Society, has been appointed to the engineering staff of the University of California, Los Angeles. Mr. Rosenthal will specialize in the field of welding and industry.

* *

E. N. STEVENS, who has been in the oxy-acetylene industry since 1912 and was most recently with the Boyd Welding Co., Erie, Pa., has joined the Welding Equipment and Supply Co., Detroit.

Improved Construction and Design

IN

BP Co

BANNER

SPOT

WELDERS

SIMPLIFIES YOUR RESISTANCE WELDING PROBLEMS

Write today on your official letterhead for descriptive Bulletin SP-75B

Illustrated - 7.5 KVA Bench-type water-cooled Spot Welder.

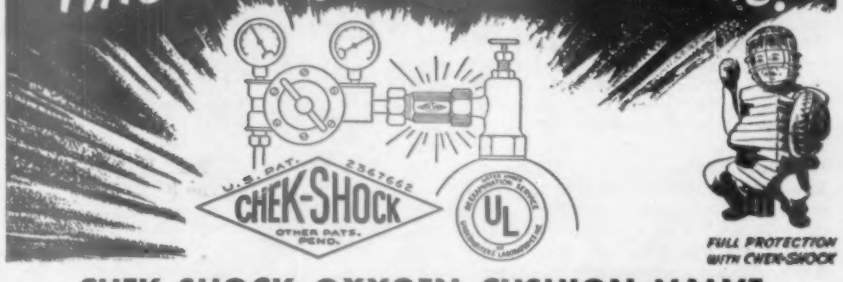
Stock delivery!

BANNER PRODUCTS COMPANY

MFGRS. OF RESISTANCE WELDERS AND INCANDESCENT BRAZERS

4934 N. 29TH STREET • MILWAUKEE 9, WISCONSIN

This Danger Never Warns!



FULL PROTECTION WITH CHEK-SHOCK

CHEK-SHOCK OXYGEN CUSHION VALVE

SOFTLY controls the vicious "jolt" of high pressure oxygen gas, thus eliminating regulator repairs and preventing possible injury to operators.

- Will allow tank valve to be opened rapidly without damage to regulator or danger to operator.
- Will increase life of regulator assembly.
- Will eliminate possible injury to operator from burstings.
- Will prevent unnecessary internal wear in regulator (*as NOT necessary to release control screw before opening tank valve*).

PRICE IS LESS THAN ONE REPAIR BILL ($6.00 EA.)

#1. STANDARD COUPLER . . . for all standard size welding type oxygen regulators.
#2. LIGHT COUPLER . . . for "airplane" or soldering size oxygen regulators.
#3. HEAVY DUTY COUPLER . . . recommended for extra heavy duty work only.
#4. SCREW TYPE COUPLER . . . for removable inlet stem regulators (¼" pipe) available in standard, light, or heavy capacities.
#5. FOR HYDROGEN . . . left hand thread coupler.

We also Make MEDICAL CHEK-SHOCKS for All Types of Medical Regulators and Tank Fittings (chrome plated) . . . $7.00 Ea.

SEE YOUR DISTRIBUTOR OR WRITE—

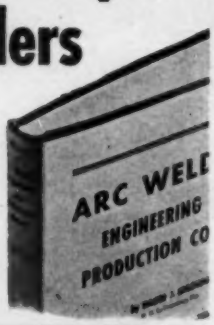
Chek-Shock MFG. CO.

FOWLER, CALIF.

Practical help for welders

in these 2 McGraw-Hill books

See them 10 days on approval



Arc Welding Engineering and Production Control

By WALTER J. BROOKING, Director of Testing and Research, R. G. LeTourneau, Inc., 347 pgs., 5½ x 8, 227 illus., $4.50

A manual of the arc-welding process as applied in manufacturing and fabrication, drawing largely on typical industrial experience for a helpful blend of the shop skills and technical know-how required by operators, inspectors, engineers, and others concerned with the use of the process. Discusses fully the significance of materials, fixtures, engineering control, process planning and organization, and, other factors, and shows how to analyze them as a basis for the effective application of arc welding to specific manufacturing problems.

Electronic Control of Resistance Welding

By GEORGE M. CHUTE, Application Engineer, General Electric Co., Detroit. 389 pages, 6 x 9, 152 illustrations, $4.50

An unusually simple and practical manual, fully explaining the tubes and circuits used to control resistance welders in industrial plants, for the aid of men who work with and maintain these controls.

From it, the man with no previous training in electronics can gain a sound knowledge of tubes and circuits and their application in all varieties of control devices, including synchronous timers and stored energy controls. How the tubes work, power requirements, the factors of good welding involved, installation and maintenance of the devices—everything is covered to give the reader the ability to get the most in long life and efficient service from these equipments.

MAIL THIS COUPON

McGRAW-HILL BOOK CO.,
330 W. 42nd St., N. Y. 18, N. Y.

Send me the books checked below for 10 days' examination on approval. In 10 days I will send remittance, plus few cents postage, or return books postpaid. (Postage paid on cash orders).

☐ Brooking—Arc Welding Engineering and Production Control—$4.50

☐ Chute—Electronic Control of Resistance Welding—$4.50

Name_____

Address_____

City & State_____

Company_____

Position_____ WE-1-47

(For Canadian price write Embassy Book Co., 12 Richmond Street E., Toronto 1).

ROBERT O. BULLARD, EDGAR L. HUBBARD and JOHN A. BEALS have been appointed to administrative positions in the metallurgy division of the General Electric Chemical Department.

* *

DONALD T. MCCOY has been assigned Ohio sales representative for the Belden Manufacturing Co., Chicago, Mr. McCoy will handle Belden's cable for arc welding and other purposes.

* *

GEORGE P. TORRENCE was recently elected president of the Link-Belt Co., Chicago. He succeeds WILLIAM C. CARTER, who retires from this position in accordance with the company's retirement plan.

* *

HARRY A. DENNIS has been appointed assistant district manager of sales in the Chicago office of Lukens Steel Company and subsidiaries, By-Products Steel Corp. and Lukenweld, Inc.

* *

ORVILLE T. BARNETT has been appointed division engineer, electrode division, Metal & Thermit Corp., New York City. This appointment constitutes a transfer from the production to the sales department.

* *

L. H. MOULTON has been appointed national sales director of Turco Products, Inc., Los Angeles. D. T. BUIST has been named to assist Mr. Moulton in directing the nationwide sales-service staff.

* *

Died . . .

EDWARD G. BUDD, founder and president of the Edward G. Budd Manufacturing Co. and Budd Wheel Co., Philadelphia, died November 11. Mr. Budd started his business in 1912 within a rented canvas circus tent. From this modest beginning the company grew until it now occupies more than 4,000,000 sq ft in buildings in Philadelphia and Detroit. In the early years of the depression the company entered an entirely new field. With the perfection of the "Shotweld" system and the experience gained in the construction of a stainless steel airplane, it was decided to embark on a program of designing and building light-weight stainless steel truck trailers and railroad passenger trains.

* *

CHARLES DREW YOUNG, sales manager of Metal & Thermit Corp., died November 16 at the Orange, N.J. Memorial Hospital after a brief illness. Mr. Young joined the Metal & Thermit sales organization in 1911 and in 1930 was made district manager in Chicago. He was a vice-president of the National Railway Appliances Association, having served a number of years on its board of directors. He was also a member of the executive committee of the Chicago section of the American Welding Society.

The **MIDGET HEAT TREATER**

... will solve your Brazing Problems

- **For experimental and development work**
- **For small production jobs**
- **Equally suitable for preheating, soft soldering, flame hardening, and flame annealing**

Uses city gas and air

Write for Information

GAS APPLIANCE SERVICE, INC.

1211 Webster Avenue Chicago 14, Illinois

"SPE-WELD"

LOW TEMPERATURE WELDING RODS AND FLUXES FOR *ALL METALS*

SPECIAL WELDING ALLOY CO., INC.
27-33 Jackson Avenue
LONG ISLAND CITY 1, N. Y.

Builders of
POSITIONERS
AND
FIXTURES
for
Manual
and
Automatic
Welding

BENTLEY WELDERY, Inc.
Teall Ave. and Riegel St.
SYRACUSE, N. Y.

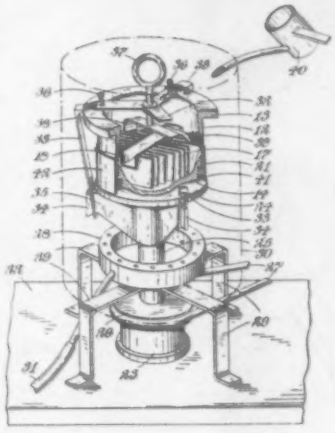
ALADDIN ROD

No Puddling **WELD** No Flux
WHITE METAL
(DIE CAST)
SOLDER & BRAZE
ALUMINUM
WITH
ALADDIN ROD
and
PATENTED METHOD

When you use the ALADDIN 3 in 1 ROD and Patented Method you can weld White Metal (die cast) and braze Aluminum, easily and quickly. ALADDIN is the only rod guaranteed to produce welds of greater tensile strength than the original metal. Instructions with every pound. Rod sizes are: 1/16", 1/8", 3/16", 1/4", and complete assortment. Write Department A for FREE Literature

ALADDIN
ROD & FLUX MFG. CO.
P.O Box 935 Madison Sq. Sta. Grand Rapids, Mich.

From the Patent Office



Brazing Process

2,411,439 GEORGE HERBERT LEE, Bristol, England, assigned to THE BRISTOL AEROPLANE CO., Limited, Bristol, England. Filed June 9, 1944, in Great Britain April 6, 1943. Issued November 19, 1946.

A brazing process for simultaneously uniting a plurality of cooling fins to the base of a junkhead of an internal-combustion engine and the base to a tubular wall of the head. After assembling the fins to the base and the base to the wall, a flux is introduced to the assembled head, which is heated and simultaneously rotated. The brazing material is then introduced while the head is being rotated and heating continues. The molten material is thus caused to flow over the junction of the fins and the base and of the base and the wall. During the subsequent cooling steps the speed of rotation is controlled to determine the form of the brazing joint between the fins and the base and between the base and the tubular wall.

* * *

Bonding Rubber to Metal

2,409,759 OAKLEY W. HOSKING, Monroe, N. Y., assigned to COMPOSITE RUBBER PRODUCTS CORP., Bridgeport, Conn. Filed September 13, 1941. Issued October 22, 1946.

A method of bonding a cured rubber composition directly to a cuprous alloy article of the class consisting of brass and bronze articles. An untreated surface of the cured rubber composition is brought into direct contact with a highly polished, smooth surface of the cuprous alloy. Sufficient pressure is maintained at the rubber-metal interface to insure intimate contact between the rubber and the cuprous alloys; and sufficient heat is applied to cause the rubber to adhere to the alloy surface.

ESTABLISHED 1883

PNEUMATIC DALLETT EQUIPMENT ACCESSORIES

A Symbol of Distinguished Quality

DALLETT'S Trademark designates an inherent manufacturing integrity that is built into every hand crafted tool and accessory.

•

In 1883, when Thomas H. Dallett established his factory in Philadelphia, he was determined to make one quality of tools—*only the finest*. He never deviated from that determination.

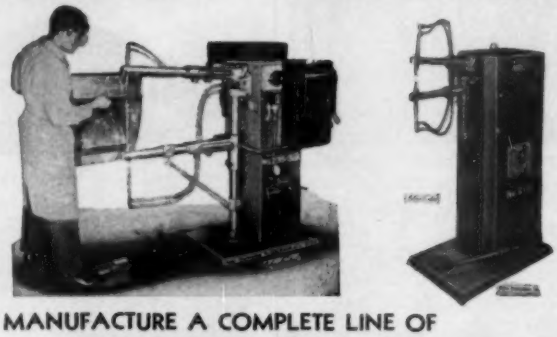
•

The reputation which Dallett enjoys today for distinguished quality is a cumulative reputation; it has been earned the hard way through the consistent and non-deviating adherence to its founder's high requirements.

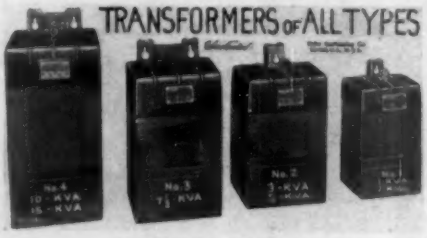
See the Classified Section of your Telephone Directory

THE DALLETT COMPANY
Mascher at Lippincott St., Philadelphia 33, Pa.
Manufacturers of Pneumatic Tools and Accessories
Distributors
in Principal Cities throughout the United States, Canada, Europe, and South America

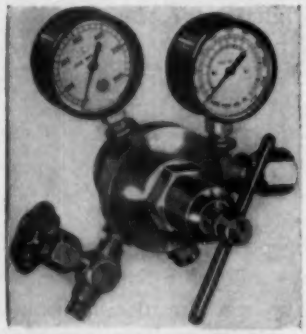
BUTT WELDERS
GUN WELDERS
SPOT WELDERS
ARC WELDERS
JOB WELDING



WE MANUFACTURE A COMPLETE LINE OF
RESISTANCE SPOT WELDERS
FROM ¼ TO 250 KVA FOR ALL TYPES OF WELDING



TRANSFORMERS
We make transformers for all purposes. Send us your full specifications.
Sizes from ¼ to 250 KVA.
CHAS. EISLER
EISLER ENGINEERING COMPANY
749 S. 13th St. (near Avon Ave) Newark 3, N. J.



Nageldinger Style "N" 608 Regulator for delivery of pressures up to 500 lbs. p.s.i.

We Manufacture Oxygen Therapy Apparatus · Cylinder Valves · Cylinder Manifolds · Needle Valve Controls Welding and Cutting Equipment · Pressure Regulating Valves & Regulators · Safety Valves · Compressed Gas Apparatus for: Oxygen, Hydrogen, Nitrogen, Acetylene, Carbon-Dioxide, Helium, Etc.

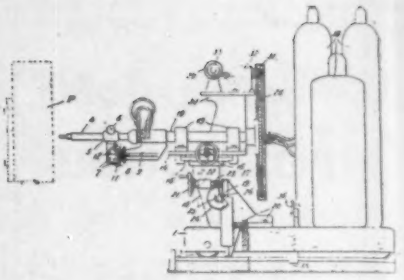
Send for 32-Page Catalog Featuring Welding and Cutting Equipment and Supplies.

JOHN NAGELDINGER & SON
Incorporated
Established 1880
Factory and Office at
409 E. 91st St., New York 28, N. Y.

ELECTROLOY
for
BUTT, FLASH, PROJECTION, SPOT and SEAM
WELDING ELECTRODES

Ask for our NEW catalog covering the MOST COMPLETE LINE OF RESISTANCE WELDING ACCESSORIES.

THE ELECTROLOY CO., INC.
1600 Seaview Ave.
BRIDGEPORT, CONN.



Vertical Circle Cutting

2,411,182 JAMES L. ANDERSON, Closter, N. J., assigned to Air Reduction Co., Inc., New York City. Filed April 11, 1944. Issued November 19, 1946.

Apparatus for making circular cuts in vertical metal plates. It comprises a carriage movable toward and away from the plate to be cut and a rotatable shaft mounted on the carriage so that its axis is at right angles to the vertical face of the plate. The torch is connected to the shaft with its tip directed toward the vertical face of the plate. The torch may be adjusted laterally with respect to the shaft, while the shaft may be adjusted vertically or horizontally on the carriage. A means operative in any adjusted position revolves the torch bodily about the axis of the shaft.

* *

Butt Welder

2,409,636 JOHN B. LITTLE, Summit, N. J., assigned to BELL TELEPHONE LABORATORIES, INC., New York City. Filed October 20, 1944. Issued October 22, 1946.

This patent pertains to a device for welding the ends of a metallic tape in coaxial abutting relation to each other, the device comprising a base, a fixed electrode secured to the base and a movable electrode supported in spaced relation to the base and in a common plane relative to the stationary electrode. The patent covers means for adjustably positioning the ends of the tape relative to the adjacent end portions of the electrodes in welding position and means for securing the ends of the tape on the electrodes in adjusted welding position. The tension of the supporting spring means imparts movement to the movable electrode for urging the ends of the tape against each other to the weld.

* *

Coated Welding Rod

2,410,850 RENE D. WASSERMAN, New York City. Filed October 5, 1944. Issued November 12, 1946.

A welding or brazing rod having a corrosion-resistant metallic film produced by successive strata of metals of melting point below 800 F. These metals are selected from the group comprising bismuth, tin, zinc, cadmium, lead and antimony. The thickness of this metallic film is below .05 in. but is sufficient to protect the surface of the weld material against the attack of atmospheric influences during storage. However, the quantity of metallic film is of such moderate amount as to leave the base metal unaffected when the weld metal is applied.

Flame-Hardening Apparatus

2,410,005 JAMES O. BISHOP, Torrance and LLOYD L. BABOCK, Compton, Calif., assigned to THE NATIONAL SUPPLY CO., Pittsburgh. Filed August 3, 1940. Issued October 29, 1946.

The combination of a torch having a first passageway for combustible gas and a second passageway for the circulation of a coolant, means including a valve for selectively admitting combustible gas to the first passageway, means for actuating the valve to open position and a conduit for delivering a coolant under pressure to the second-passageway. A diaphragm is actuated by the pressure in the conduit to hold the valve-actuating means toward open position until the pressure in the conduit has reached a predetermined value.

* *

Underwater Electrode

2,410,461 BELA RONAY, Annapolis, Md. Filed April 5, 1944. Issued November 5, 1946.

A hollow welding or cutting electrode, through which oxygen under pressure may be directed to the forward open end. This electrode consists of an open-seam tubular core enclosed in and sealed along its length by a moisture-impervious insoluble coating. The coating is adapted to be disintegrated at a lower rate of speed than that of the electode core, thereby insuring the formation of a crater at the end of the rod adjacent to the zone of operation.

CRACKED BLOCKS
REPAIRED 400% FASTER
with the new patented
MOGULOID ARC BONDER

* The Moguloid Arc Bonder repairs cracked blocks 4 times faster than standard pinning or lacing methods—and assures perfect surface appearance. Actually makes permanent metal-to-metal bond without danger of heat distortion and stresses. Ideal also for press fit work, building up low spots on differential housings and transmission covers and countless other shop jobs. Get complete information now. Write today for Bulletin No. 50.

MOGULOID COMPANY OF AMERICA
Division of Metallizing Company of America
Dept. WE, 1330 W. Congress Street, Chicago 7, Illinois

WELD-A-CAST FLUX

WELD-A-CAST

Ask your dealer — or write

The Old Brand is Still the best

No. 1. For Welding with Cast Iron Rod.

No. 3. For Brazing and Bronze Welding.

No. 4. For Welding Cast Aluminum.

CORTLAND WELDING COMPOUND CO.
Cortland, N. Y.

Another New **DE-STA-CO** HEAVY DUTY *Plunger Clamp*

DE-STA-CO MODEL NO. 620 *Reverse Action-Plunger Type*

A new, versatile, plunger type clamp, designed to assure positive parallel clamping action during welding, drilling, assembly or milling operations. Excellent for quick-action and the locking of work in jigs and fixtures.

Plunger rod is tapped to receive ⅜"—16 bolt for adjusting. Reverse action permits operating ease in congested areas and where working height is limited.

Available from our distributors in the U.S.A. and Canada.

Write today for catalog No. 47

DETROIT STAMPING CO.
Established Over 30 Years
372 Midland Ave • Detroit 3, Mich.

"ANTI-BORAX"
FLUXES

SO IMPORTANT . . . . .
YET COST SO LITTLE

"Anti-Borax" Fluxes are GOOD . . . they are GUARANTEED. For best results in welding cast iron, brass, bronze, malleable iron, stainless steel, and aluminum use "ANTI-BORAX" Fluxes.

- No. 1 Cast Iron Welding Flux
- No. 2 Brazing Flux for Brass, Bronze, etc.
- No. 4 "Brass-Cast" Flux for Bronze Welding Cast Iron
- No. 5 Aluminum Flux for Cast Aluminum
- No. 8 Aluminum Flux for Sheet Aluminum
- No. 9 Stainless Steel Welding Flux
- No. 11 Tinning Compound
- No. 16 Silver Solder Paste Flux

Send for free samples

Manufactured only by

ANTI-BORAX COMPOUND CO.
FORT WAYNE, IND.

FOR THOSE INTERESTED IN OR WORKING IN WELDING

Read —
"Welding —
ITS QUESTIONS AND ANSWERS"

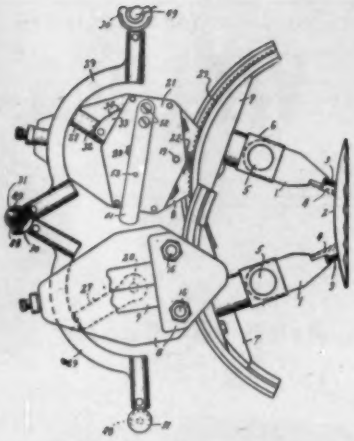
by T. B. JEFFERSON, B.S., M.E.
Editor, THE WELDING ENGINEER

For the correct answers to the more difficult welding questions. At the same time an attempt has been made to cover all phases of welding so that a complete picture of welding, for student, weldor, supervison or engineer, may be obtained from a single volume.

$1.50 per copy
Handy Size — 5 x 8 in.
176 *Pages*

Published by

The Welding Engineer
520 N. Michigan Ave., Chicago 11, ILLINOIS
A McGraw-Hill Publication



Flame-Hardening Method

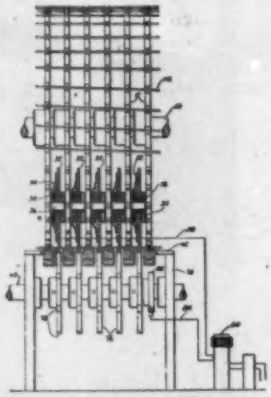
2,410,134 LAWRENCE J. STEVENSON, Torrance and LLOYD L. BABOCK, Compton, Calif., assigned to THE NATIONAL SUPPLY CO., Pittsburgh. Filed January 16, 1942. Issued October 29, 1946.

The method of flame-hardening a continuous surface by directing two separate heating flames against a common position on the surface, traversing the flames simultaneously in opposite directions. Streams of quenching fluid are directed against the surface immediately following application of the flames. During the traversing movement, the angle of impingement of the flames changes from a lagging direction to a leading direction. Both flames are extinguished upon their meeting at a common location remote from the starting position.

* *

Multiple Seam Welder

2,410,766 THEODORE HARRY WICKWIRE, JR., Ardmore, Pa., assigned to THEOWICK COMPANY, Philadelphia. Filed June 18, 1943. Issued November 5, 1946.



A machine for fabricating welded wire fabric having several pairs of welding wheels and means for feeding a wire strand between the wheels of each pair. The pairs of welding wheels are in alignment on a line extending at right angles to the strands. The transverse wires are successively placed across the strands and between the wheels at an angle to the strands differing from 90 degree. A transverse wire is thus between wheels of different pairs at different instants.

Are you paying too much for lenses?

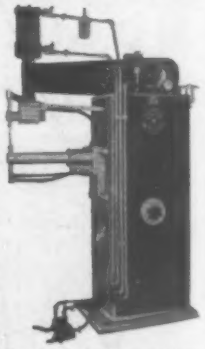
• Spending more for lenses than you need to is like throwing money away. Save it, by ordering Amcoweld.

Protective Lenses that are not only reasonable in cost but also "tops" in quality and service life. All shades — all types (flat, clear and coated) for welders helmets, hand shields, goggles, and spectacles. Prompt delivery.

Write for fully descriptive literature and prices.

EASTERN EQUIPMENT CO., INC.
Industrial Safety Division
WILLOW GROVE, PENNA.
Manufacturers of Amcoweld Products

ALPHIL
SPOT WELDERS
for more work at lower cost
•
Built for both foot and air operation



Air-Operated Press Type Spot Welder Model AR.

All type welders in stock and made to order.
Alphil Welders are of proved dependability. Their versatility makes them adaptable to a wide range and variety of work. They are widely used for sheet metal and wire fabrication, and are especially advantageous where jobs involve "hard-to-get-in places".

Attention Distributors!
Write us regarding open territory.

ALPHIL
SPOT WELDER MFG. CO.
1058 Pacific St., Brooklyn 16, N.Y.
Cable Address, "Alphilweld"

DOUBLE DUTY
from your Welding Torch
with a
BINGO
SOLDER KIT

Slips onto Your Welding Torch Tip

Provides an air-acetylene flame for body-soldering, tinning and silver soldering.

Uses Acetylene Only

COMPLETE KIT Consisting of body and two tips. $2.75

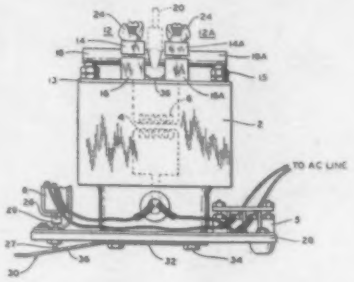
DISTRIBUTORS! Write for complete details.

BEAVERDELL Company
817 Webster Avenue, Chicago 14, Illinois

W-AL-CO
WHITE METAL FILLER ROD
●
No. 716 LOW-MELTING ALUMINUM BRAZING ROD
●
ALUMINUM, SOLDER
●
WELDING ALLOYS MANUFACTURING CO.
744 Broad Street
NEWARK 2, N. J.

Heater for Soldering Irons

2,411,549 Le Roy John Lindberg, Wanamassa, N. J. Filed March 3, 1945. Issued November 26, 1946.



A transformer mounted on an apertured baseboard and having in its secondary circuit a pair of electrodes complementary to the tip portion of a soldering iron. A normally-open switch forming a part of the primary circuit of the transformer is also mounted on the baseboard about the apertured area. A leaf spring is fixed to the lower side of the baseboard, having a downwardly converging portion disposed under the apertured area. A plunger is slidably positioned through the apertured area. Insertion of a soldering iron into the electrodes will cause relative movement of the baseboard and spring, thereby moving the plunger upwardly to close the normally-open switch and complete the primary circuit of the transformer.

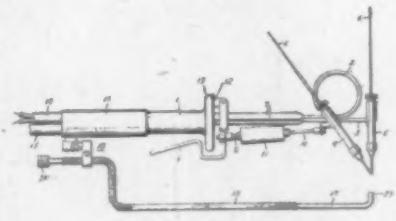
* *

Electrode Holder

2,410,164 Honel A. Jackson, Detroit. Filed February 4, 1944. Issued October 29, 1946.

An electrode holder comprising an electrically conducting head, an insulating cover surrounding the head and a socket to receive the end of an electrode. The insulating cover has an opening through which the end of the electrode is passed into the socket. A pin of insulating material passes through cooperating openings in the head and insulation to lock the insulating cover on the head.

* *



Atomic-Hydrogen Hand Torch

2,411,465 George Richardson and John Horlick, Lynn, Mass., assigned to General Electric Co., New York City. Filed October 21, 1944. Issued November 19, 1946.

A gas-arc torch comprising a handle, electrode holders, a nozzle having a discharge opening through which gas is directed about the arcing terminal of two electrodes supported in the holders.

COMING SOON!
12th EDITION
of the
Welding
Encyclopedia

AMERICA'S LARGEST LINE OF *Welding* COMPOUNDS & *Fluxes*

Specializing since 1910, we have developed more than one hundred formulas for soldering, welding, and brazing.

Our research laboratories are at your disposal for any flux problems.

Write for catalog and price list.

AMERICAN SOLDER & FLUX CO.
2156 E. NORRIS ST., PHILADELPHIA 25, PA.

STOP

Rust After Welding

STOP rust from getting in its destructive attack on ferrous parts both before and after welding, as well as after machining operations. Immerse work in Oakite Special Protective Oil for dependable protection against indoor moisture and humidity.

You'll find that this simple, economical procedure produces a thin transparent but impenetrable film defying indoor rust under practically all shop conditions. It eliminates costly pre-drying, assures smooth-flowing production operations.

FREE 20-page booklet describes many other applications for Special Protective Oil. Write NOW.

OAKITE PRODUCTS, INC.
75 Thames Street, NEW YORK 6, N. Y.
Technical Representatives in Principal Cities of U. S. & Canada

OAKITE

Specialized Industrial Cleaning
MATERIALS • METHODS • SERVICE

EVER-KLEAR COVER LENS

SEVENTEEN YEARS OF PROVEN SERVICE

Employ Ever-Klear Lens for better welding

Size 2x4¼" for arc-welding shields $2.40 per dozen
Sizes 46½ to 50 M.M., for goggles 35c per pair

GOOD VISION IS IMPORTANT!
preserve your most valuable possession — good eyesight

Avoid eye strain. For guarding your eyes against strain while doing prolonged and intensive eyetasks, as in welding, use Ever-Klear Cover Lens.

Ever-Klear Lens cannot pit or allow molten sparks to fuse on the surface.

F. R. FAULK, Distributor
403 Penn Ave. Pittsburgh 22, Pa.

Acetylene Generator

2,409,833 WILLIE D. BURCH, Oklahoma City, assigned one-half to FORREST PARROTT, Oklahoma City. Filed June 26, 1944. Issued October 22, 1946.

In an acetylene generator, a housing provided with a carbide hopper, a water reservoir and a measuring receptacle below the hopper. The latter is provided with a valve seat at its lower end; the valve for the seat has a depending stem, the vertical axis of which interests a control rod slidably carried by the housing. An inverted L-shaped lever is pivotally carried by the housing, with the free end of the normally horizontal arm of the lever below and closely adjacent the lower end of the stem. The normally vertical arm of the lever straddling the rod, and an abutment on the rod contacts the normally vertical arm.

* *

Weldor's Helmet

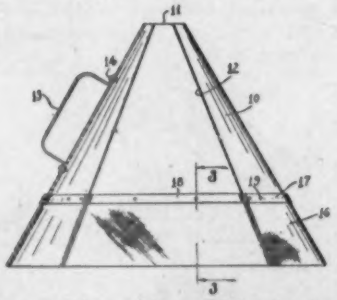
2,410,256 MARSHALL N. ANDERSON and MELVIN H. SELLSTROM, Chicago, assigned to SELLSTROM MANUFACTURING CO., Chicago. Filed July 26, 1943. Issued October 29, 1946.

A head protector comprising a headband, a face mask movable from face-shielding position to a position above the face and an eye shield movable from eye shielding position to a position above the eyes. Motion of the mask to nonshielding position moves the eye shield to shielding position, and motion of the mask to shielding position moves the eye shield to nonshielding position. The transmission between mask and shield is accomplished by a first crank arm movable with the mask and a second crank arm actuated by the first crank arm and movable with the eye shield. The crank arms have a sliding pin-and-slot connection with each other.

* *

Welding Shield

2,410,306 RAYMOND A. ROMBERG, Orange, Conn. Filed October 18, 1944. Issued October 29, 1946.



A portable welding shield having a rigid one-piece conical body with openings at the top and bottom. The top opening is of circular shape and of relatively small diameter to closely embrace a pipe or like object. An opening in the wall of the body communicates with the top and bottom openings, the width of this opening being progressively greater from top to bottom of the shield. A flexible skirt projects downwardly from the lower edge of the body. A handle is secured to the rigid body portion to enable the shield to be held during use.

METAL BOND
METAL BOND MFG. CO.
ST. LOUIS U.S.A.

WELDING AND BRAZING FLUXES

for

QUICKER, EASIER HANDLING

•

PERMANENT GOOD RESULTS

Successful welders have been using METAL BOND PRODUCTS for many years. They get uniform high quality and dependability at reasonable cost. Always abreast of newest developments—there is a METAL BOND PRODUCT for EVERY Welding or Brazing need. All METAL BOND PRODUCTS are sold on a MONEY BACK GUARANTEE.

• You can obtain complete information on the proper flux for every welding and brazing application—and how to use it properly—by writing for our CATALOG A-4 . . . Valuable! Get yours today!

METAL BOND MFG. CO.
3201 KOSSUTH AVE.
ST. LOUIS 7, MISSOURI

Abuse means Nothing to ST. PIERRE CHIPPING HAMMERS

Breaks Scale
Cleans Surface
ONE OPERATION

Here's a man-sized brush in the right position for easy use after chipping scale from welded surface. Hammer-Chisel made of highest quality tool steel. Entire tool is well-balanced. For economy, for durability use ST. PIERRE Hammers.

Order Today From Your Jobber or Direct

ST. PIERRE Chain Corporation
Worcester, Mass.